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AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

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GAS IN ENGLAND.

At St. Neots, a dividend of 12 per cent. is said to have been declared, but whether for the year or half year we are not informed.

At Lewes, the Gas Company have held their annual meeting, and declared a dividend of 10 per cent.

At Bury St. Edmund's, the price of gas has been reduced from 6s. 8d. to 6s. 3d. per thousand cubic feet.

At Blakewell, the Gas Company have declared a dividend of 10 per cent. for the past year.

At Carlisle, the price of gas has been reduced to 3s. 4d. per thousand cubic feet.

The following items we take pleasure in crediting to the London *Builder*, which always contains much valuable information relating to gas, as well as other subjects:

"The shareholders of the Eastbourne Gas Company have held their annual meeting. The report of the directors recommended that a dividend of 10*l.* per cent. should be declared; also, that there should be an increase in the capital to enable them to lay down new mains where required; and to substitute larger mains in the principal thoroughfares. The report was adopted, and it was unanimously resolved that 2,000*l.* should be raised by means of shares.

"The Newport Gas Company have just held their half-yearly meeting. The directors report that there had been an increase in the consumption of gas during the half-year as compared with the corresponding half-year of 1862, and the gas rental would have also shown an increase, but for the operation of the reduced price made at the end of June, 1862. The loss occasioned by that reduction, however, had been partly made up by the greater consumption referred to, and by the effect of a readier sale of coke and tar through the past half-year, by which loss had been prevented. The report was unanimously adopted, and a dividend at the rate of 10 per cent. per annum was declared on the class A shares, and 7½ per cent. per annum on the class B shares.

"The Debenham Gas Company have held their annual meeting. The directors of this company charge the impracticable price of 8s. 4d. per 1,000 feet for their gas, and the very natural consequence is that, though the company has been five years in existence, no dividend whatever has been received by the shareholders up to the present time; and what is more, the want of dividends is given as a reason why the price cannot be reduced; so that this 'vicious circle' must be an eternal one, unless the shareholders can open the eyes of their directors to the true interests, both of the local public and of themselves, to be realized only by a large and liberal reduction of price.

"Messrs. Hanna, Donald & Wilson, gas engineers and contractors, Paisley, have just completed, at Leominster, a new gas-holder and cast-iron tank. The gas-holder is 61 feet diameter by twenty feet deep, and the whole has been erected and completed in two months.

"The half-yearly meeting of the Liverpool United Gaslight Company has been held. The report, which was adopted, recommended that the dividend for the half-year ending 30th June last be 5*l.* per cent. on the consolidated stock of the company. After providing for this dividend, there would remain a disposable net surplus of 8,271*l.* 2s. 6d.; the amount required by the company's Act of Parliament to be placed to the credit of the reserve fund, having been already fully provided for. The directors recommended a further reduction in the price of gas, to take effect from the 1st of July last, at the following rates, namely: to all consumers within the borough of Liverpool 2d. per 1,000 cubic feet, and to all consumers in the out townships 3d. per 1,000 cubic feet, making the actual charge for gas in the borough 3s. 5., and in the out townships 3s. 9d. per 1,000 cubic feet. They also recommended a rateable reduction in the meter-rents.

GAS FROM CANNEL AND FROM COAL.

The English technical journals publish the following analysis of the comparative value of gas made from cannel and caking coals. Dr. Fyfe, the well-known Professor of chemistry in King's College, Aberdeen, performed the analyses.

A ton of English caking coal yields, on an average, at gas-works, 8,000 feet of gas; and though a larger quantity was given with my apparatus, yet we must take 8,000 as the quantity on a large scale. The value of the coal is taken as 1. The Wigan cannel yielded 9,500 and 11,500; the value of the gas, bulk for bulk, being the same, viz., 1.85 to the former as 1. Now, taking into account the quantity of gas afforded, the value of the coals for yielding light, by the consumption of their gases, is as 2.23 for the one quantity, and 25 for the other. Taking the average, we state the value of English cannel coal as 2.35, or say 2½ to Newcastle coal as 1. The following analysis of the cannel raised by the Ince Hall Coal and Cannel Company, is by Mr. John Leigh, M. R. C. I., Consulting Chemist to the Manchester Corporation Gas-Works:

Carbonic oxide and aqueous vapor	1.58
Olefiant gas and divers hydro-carbons	8.50
Atmospheric air	4.32
Nitrogen	0.19
Hydrogen	40.30
Light carburetted hydrogen	33.88
Carbonic acid	11.35
	100.02
Quantity of gas produced	11.673 cubic ft.
Specific gravity of gas	5.20 "
Coke produced from 1 ton of cannel, 13 cwt. 18 lbs.	

This cannel is used by the chief gas-works of this country, including London, Liverpool, Manchester, and Birmingham, and by the principal foreign gas-works, both on the Continent and in North and South America. The analysis of the same company's gas-coal, made by Mr. J. E. Clift, Engineer to the Pagoda Gas-works, Birmingham, gives:

Carbon, from 100 parts		84.50
Hydrogen,	"	5.14
Oxygen,	"	2.10
Nitrogen,	"	2.20
Sulphur,	"	0.33
Ash,	"	4.12
		98.39
Loss		1.61
		100.00

Products obtained from one ton of gas coal, being the average results obtained from using 300 tons in making gas: Gas produced, 10,200 cubic feet; illuminating power—one Argand burner consuming five feet per hour = thirteen spermaceti candles of six to the pound; specific gravity, .462, atmospheric air being 1.00. Coke produced, 13 cwt. 3 qrs., or 44 imperial bushels; suitable for iron-founders, brass-founders, and maltsters. Ammoniacal liquor produced, 20 gallons; 1 gallon requiring 10 oz. of the sulphuric acid of commerce to saturate it. Tar produced, 10 gallons. Purification of the gas: 1,000 cubic feet of gas requires 12½ lbs. of lime for its purification, which shows it to be comparatively very free from sulphur. The other impurities of coal-gas are not more abundant than in that made from other coals. A further analysis of the same company's gas-coal, made by Professor Thompson, of London, gives:

Specific gravity	1.270
Coke, per cent.	65.2
Volatile matter, per cent.	34.8
Cubic feet of gas, per ton, gross	11,400
" " " purified	11,200
Impurity per cent. in gas	1.8
Specific gravity of purified gas	406.00
Illuminating matter condensible by bromine, per cent.	4.25
Carbonic oxide in purified gas, per cent.	4.00

Illuminating power of the gas, burnt at 5 feet per hour, equal to 13.8 spermaceti candles, each consuming 120 grains per hour. Heating power of the coal: 1 lb. will convert 15½ lbs. of boiling water into steam.

PUBLIC LIGHTING OF BIRMINGHAM, ENGLAND.

The price hitherto paid for the public lighting of Birmingham has been £14,000 per annum. The Public Works Committee of that city have taken the matter in charge, and by economizing the consumption, and employing the police to light and extinguish the lamps, they expect to save no less than £7,000 a year.

"The example thus set by Birmingham," says the *Sanitary Reporter*, "is worthy of being followed by every town in the kingdom, and the expedient of employing the police may be advantageously adopted in every town where this body is appointed and controlled by the municipal authority.

"The public lighting is, in fact, the right arm of the police, and no class of men can be more fitly entrusted with the lighting and extinguising of the public lamps than those whose operations are so intimately connected with public lighting as a means of preventing and discovering crime. Nearly all over Scotland the public lamps are invariably lighted and extinguished by the police."

MINER'S SAFETY MASK.—At the recent meeting of the British Association for the Advancement of Science, Dr. Richardson, the well-known technologist, said that the idea occurred to him that it would be possible to construct a mask which the miner or other workman could wear while exposed to carburetted hydrogen and other poisonous gases in mines, for the same purpose of protection as the miner uses the safety lamp. He added, that he was sure as to the possibility of carrying out the invention to its perfection. His researches have been conducted in three directions—First, to construct a mask that shall give oxygen to the workman in case of necessity; second, to construct a mask that shall render the ordinary oxygen more active and meet the effects of the poison; third, to construct a mask that shall separate the poisonous gas from the air.

BERTHELOT'S CARBURETTED HYDROGEN.—Berthelot has recently discovered a new form of carburetted hydrogen, possessing twice the illuminating power of ordinary coal-gas. He succeeded in procuring this gas by passing hydrogen between the carbon electrodes of a powerful battery. Dr. Odling has shown that the same gas may be produced by mixing carbonic oxide with an equal volume of light carburetted hydrogen, and exposing the mixture in a porcelain tube to an intense heat. Still more recently, Mr. Siemens has detected the same gas in the highly heated regenerators of his furnaces, and there is now every reason to believe that the new gas will become practically available for illuminating purposes. Thus it is that discoveries which in the first instance interest the philosopher only, almost invariably initiate a rapid series of steps leading to results of great practical importance to mankind.

GAS-LIGHT COMPANIES IN THE UNITED STATES.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1857	ADRIAN	Mich.	50,000	50	—	May & November.	4,000	3 50	....	....	
1856	AKRON	O.	20,000	33⅓	—	Do.	3,500	3 00	....	....	
1845	ALBANY	N. Y.	25 ,000	20	4	January & July.	65,000	3 00	120	....	None in market.
1858	ALBION	N. Y.	30,000	100	—	Do.	3,000	3 50	....	....	
1851	ALEXANDRIA	Va.	106,730	—	—	City Works.	9,000	3 50	....	....	
1852	ALLEGHANY	Pa.	200,000	25	4	May & November.	25,000	3 00	....	....	
1853	ALLENTOWN	Pa.	60,000	100	3½	Do.	5,000	3 50	....	....	
1857	ALTON	Ill.	75,000	—	—	Private Works.	4,000	3 50	....	....	
1859	ALTOONA	Pa.	40,000	20	4	January & July.	5,000	3 00	....	....	
1859	AMESBURY AND SALISBURY	Mass.	30,000	25	—	Do.	7,000	4 00	....	....	
1858	ANNAPOLIS	Md.	100,000	25	—	Do.	4,000	4 00	....	....	
1858	ANN ARBOR	Mich.	25,000	50	5	March & September.	5,500	4 00	....	....	
1858	ASTORIA	N. Y.	20,000	50	—	Do.	6,000	4 00	....	....	
1855	ATLANTA	Ga.	50,000	25	5	January & July.	12,000	5 00	....	....	
1857	ATTLEBORO'	Mass.	6,000	50	3	Do.	2,000	6 00	....	....	
1850	AUBURN	N. Y.	80,000	50	5	Do.	10,000	7 00	....	....	
1851	AUGUSTA	Ga.	80,000	25	8	Do.	9,000	6 00	....	....	
1853	AUGUSTA AND HALLOWELL	Me.	84,700	50	5	Do.	10,000	4 00	....	....	
1860	AURORA	Ind.	10,000	—	—	Private Works.	3 500	3 50	....	....	{ Formerly used Sanders' Water-Gas. Recently altered to Coal Gas-Works.
1817	BALTIMORE	Md.	550,000	100	5	June & December.	150,000	2 50	150	....	None for sale.
1852	BANGOR	Me.	120,000	100	2½	January & July.	12,000	3 00	100	....	
1855	BATAVIA	N. Y.	32,000	20	4	Do.	2,500	4 00	100	100	Stock firm. Good works and well managed.
1853	BATH	Me.	65,000	100	3	April & October.	10,000	3 75	...	...	
1859	BATH	N. Y.	15,000	50	—	May & November.	3,000	7 00	....	....	
1861	BATTLE CREEK	Mich.	15,000	—	—	January & July.			....	....	
1858	BELFAST	Me.	14,000	100	—	Do.	7,000	7 00	....	....	
1856	BELLEFONT	Pa.	20,000	25	2	Do.	3,500	4 00	....	....	
	BELOIT	Wis.	30,000	—	—	Do.	4,000	4 00	....	....	
1854	BETHLEHEM	Pa.	50,000	50	4	June & December.	2,000	3 20	...	....	
1859	BEVERLY	Mass.	40,000	100	—	January & July.	4,000	4 00	....	....	
1853	BINGHAMPTON	N. Y.	50,000	50	3½	Do.	10 000	4 00	....	....	
1859	BIRMINGHAM	Pa.	40,000	50	—	Do.	4,000	4 00	....	....	
1855	BLOOMINGTON	Ill.	40,000	50	—	Do.	6,000	4 00	....	....	
1858	BORDENTOWN	N. J.	50,000	25	3	June & December.	4,000	3 80	....	....	
1822	BOSTON	Mass.	1,000,000	500	5	Do.	130,000	2 25	....	....	
1859	BRATTLEBORO'	Vt.	21 000	—	—	Do.	3,000	4 00	....	....	
1851	BRIDGEPORT	Ct.	90,000	25	4	January & July.	10,000	4 00	90	....	Passed last dividend.
1857	BRIDGETON	N. J.	50,000	20	—	Do.	5,000	4 00	....	...	
1856	BRISTOL	Pa.	30,000	25	3	February & August.	3,000	4 00	....	....	
1855	BRISTOL	R. I.	35,000	50	2	January & July.	6,000	4 00	....	....	
1859	BROCKPORT	N. Y.	25,000	100	3	Do.	1,500	4 00	....	....	
1858	BROOKLINE	Mass.	66,000	100	3½	February & August.	3,500	3 50	....	....	
1825	BROOKLYN	N. Y.	2,000,000	25	5	January & July.	75,000	2 50	170	160	
	BROWNSVILLE	Pa.				Do.			....	....	
1848	BUFFALO	N. Y.	600,000	50	5	Do.	70,000	2 90	140	125	
1852	BURLINGTON	N. J.	100,000	25	3½	Do.	5,000	4 00	105	....	
1853	BURLINGTON	Vt.	75,000	25	2½	Do.	10,000	4 50	....	....	
1859	BURLINGTON	Iowa.	65,000	50	—	Do.	8,000	4 00	....	....	
1861	CALAIS	Me.	90,000	100	—	Do.	10,000	3 50	....	....	
1852	CAMBRIDGE	Mass.	300,000	100	5	February & August.	20,000	3 50	100	97½	
1852	CAMDEN	N. J.	300,000	100	3	April & October.	15,000	3 50	105	100	
1853	CANANDAIGUA	N. Y.	50,000	50	—	January & July.	3,000	4 00	90	80	
1856	CANTON	O.	19,000	50	6	March & September.	6,000	3 00	....	....	
1853	CAPE ISLAND	N. J.	80,000	100	—	October.	10,000	6 00	....	....	{ Watering place.—These Works only run in summer.
1860	CARBONDALE	Pa.	16,000	25	—	March & September.	5,000	4 00	....	....	
1855	CARLISLE	Pa.	30,000	25	—	January & July.	4,000	4 00	....	...	
1856	CATASAUQUA	Pa.	15,000	25	5	May & November.	2,000	4 00	....	....	
1858	CATSKILL	N. Y.		—	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
1857	CHAMBERSBURG	Pa.	30,000	25	—	January & July.	3,000	4 00	....	....	
1846	CHARLESTON	S. C.	723,800	25	4	Do.	50,000	4 00	....	....	
1851	CHARLESTOWN	Mass.	200,000	50	4	Do.	30,000	3 00	105	....	
1858	CHARLOTTE	N. C.	14,000	50	10	March & September.	3,500	6 00	....	....	
1859	CHARLOTTEVILLE	Vt.	15,000	25	—	Do.	4,000	4 50	....	...	
1851	CHELSEA	Mass.	100,000	100	3½	January & July.	8,000	3 50	....	....	
1856	CHESTER	Pa.	35,000	25	3	April & October.	4,000	4 00	....	....	
1849	CHICAGO	Ill.	1,300,000	25	5	January & July.	100,000	2 50	150	140	Very scarce. Stock wanted.
1857	CHICOPEE	Mass.	50,000	20	—	Do.		4 00	....	....	
1851	CHILLICOTHE	O.	40,000	25	4	Do.	12,000	3 50	....	....	
1841	CINCINNATI	O.	1,600,000	100	5	Do.	225,000	2 50	....	....	
1859	CITIZENS', BROOKLYN	N. Y.	1,000,000	20	—	Do.	135,000	2 00	128	125	
1860	CITIZENS', READING	Mass.	90,000	100	—				....	....	
	CLARKESVILLE	Tenn.	100,000	50	—	Do.	5,000	4 00	....	....	
1860	CLAREMONT	N. H.	20 000	100	—	March & September.	3,000	4 00	....	....	
1846	CLEVELAND	O.	200,000	10	5	January & July.	20,000	3 00	....	....	
1858	CLINTON	Mass.	30,000	500	5	Do.	3,000	4 00	....	...	
1859	CLYDE	N. Y.	10,000	50	4	Do.	2,500	4 00	...	....	
1854	COHOES	N. Y.	50,000	20	3½	April & October.	5,000	3 60	....	....	
1860	COLD SPRING	N. Y.	30,000	50	—	Do.	3,500	4 00	80	....	{ Formerly Rosin-Gas, but now Coal. A well managed company. Stock firmly held.
1860	COLD WATER	Mich.	25,000	50	5	January & July.	4,000	4 00	....	....	
1852	COLUMBIA	Pa.	37,500	25	—	Do.	4,000	3 50	....	....	
1852	COLUMBIA	S. C.	44,000	25	4	Do.	6,000	6 00	....	....	
1857	COLUMBIA	Cal.	50,000	25	—	Do.	4,500	10 00	....	....	
1858	COLUMBUS	Ga.	54,000	25	5	Do.	5,000	7 00	....	....	
1850	COLUMBUS	O.	100,000	10	6	Do.	30,000	3 00	....	....	
1853	CONCORD	N. H.	50,000	50	5	Do.	8,000	3 50	....	....	
1853	COVINGTON AND NEWPORT	Ky.	100,000	50	3½	Do.	28,000	4 00	...	....	
1854	CUMBERLAND	Md.	60,000	50	3	Do.	6,000	4 00	....	....	
1857	DANBURY	Ct.	50,000	25	4	Do.	2,000	3 75	....	...	
1856	DANVILLE	Pa.	30,000	25	—	June & December.	3,000	4 00	....	....	
1855	DAVENPORT	Iowa.	56,000	100	—	Do.	6,000	5 00	....	....	
1848	DAYTON	O.	50,000	25	5	February & August.	8,000	3 50	....	....	
1853	DEDHAM	Mass.	40,000	50	—	January & July.	3,000	4 00	....	....	
1860	DELAWARE	O.	30,000	25	—	Do.	2,500	3 00	....	....	
1849	DETROIT	Mich.	500,000	50	5	Do.	30,000	3 50	160	150	Excellent Stock. No sales.
1860	DOBBS' FERRY	N. Y.	25,000	—	—	Do.	3,000	4 00	....	....	
1854	DORCHESTER	Mass.	150,000	100	—	Do.	14,000	4 00	....	....	
1859	DOVER	Del.	12,000	—	—	Private Works.	2,000	4 00	....	....	
	DOVER	N. H.				January & July.			....	....	
1857	DOYLESTOWN	Pa.	50,000	—	—	Do.	3,000	4 00	....	....	
1854	DUBUQUE	Iowa.	100,000	50	—	Do.	17,000	4 50	....	....	
1853	EAST BOSTON	Mass.	133,000	25	4	Do.	20,000	3 50	....	145	
1858	EAST GREENWICH	R. I.	11,200	100	15	Do.	3,000	7 00	....	....	No transactions.
1861	EAST HAMPTON	Mass.	10,000	25	—	Do.	5,000	9 00	....	....	
1861	EAST NEW YORK	N. Y.	50,000	50	—	Do.	12,000	3 50	....	....	
1857	EASTON	Md.	9,000	10	—	Do.	1,500	7 00	....	....	
1850	EASTON	Pa.	125,000	50	4	June & December.	6,000	3 60	....	....	
1856	EASTPORT	Me.	50,000	55	—	Do.	3,000	4 00	....	....	
1855	ELIZABETH	N. J.	100,000	20	4	January & July.	14,000	3 50	....	....	
	ELLICOTT'S MILLS	Md.	10,000	—	—	Do.	4,000	4 00	....	....	
1859	ELMIRA	N. Y.	50,000	25	3½	Do.	5,000	4 00	...	...	
1852	ERIE	Pa.	68,000	50	3½	June & December.	10,000	3 00	....	....	
1853	EVANSVILLE	Ind.	60,000	50	4	January & July.	12,000	4 00	110	....	A very good Company.
	EXETER	N. H.	60,000	—	—	Do.	12,000		. ..	...	
	FAIR HAVEN	Ct.	20,000	25		Do.	8,000	4 00	....	....	
1847	FALL RIVER	Mass.	26,000	—	—	Private Works.	12,000	3 50	....	....	
1859	FAYETTEVILLE	N. C.	25,000	100	6	January & July.	7,000	6 00	....	....	
	FIFTH WARD (Milwaukee)	Wis.	50,000	25	—	Do.	10,000	4 00	....	...	
1857	FISHKILL	N. Y.	10,000	20	—	April & October.	1,500	9 00	....	....	
1853	FITCHBURG	Mass.	100,000	50	3	January & July.	5,000	4 00	....	....	Make Petroleum-Gas.
1859	FLEMINGTON	N. J.	20,000	—	—	Do.	3,000	4 00	...	....	
1855	FLUSHING	N. Y.	20,000	50	1½	March & September.	6,500	4 00	.	....	
1858	FORT WAYNE	Ind.	40,000	25	—	Do.	6,000	4 00	...	....	
1851	FRANKFORT	Ky.	50,000	—	—	City Works.	5,500	4 50	...	...	
1851	FREDERICK CITY	Md.	36,000	100	—	January & July.	5,000	6 70	....	....	
1854	FREDERICKSBURG	Va.	72,500	50	5	Do.	4,500	4 00	....	....	
1858	FREDONIA (Natural Gas)	N. Y.	10,000	100	—	Do.	2,000	4 00	....	....	Unlimited supply of Natural Gas.
1856	FREEPORT	Ill.	20,000	100	—	May & November.	10,000	4 00	....	....	

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When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	REMONT	O.	25,000	25	—	May & November.	2,000	4 50	....	....	
1858	F. 1TON	N. Y.	12,000	100	—	Do.	4,000	7 00	....	....	
1855	GALENA	Ill.	70,000	100	—	Do.	8,000	4 00	....	....	
1859	GALION	O.	25,000	25	—	January & July.	1,800	3 00	....	....	
1858	GALVESTON	Texas.	150,000	50	—	May & November.	7,000	6 00	....	....	
1854	GARDINER	Me.	100,000	50	4	Do.	8,000	4 00	....	....	
1853	GENEVA	N. Y.	75,000	25	2½	Do.	6,000	4 00	....	....	
1851	GERMANTOWN	Pa.	Merged	into	the	Philadelphia Works.	12,000	2 25	....	....	
1859	GETTYSBURG	Pa.	20,000	50	3	January & July.	2,500	4 00	....	....	
1854	GLENS'S FALLS	N. Y.	35,000	50	3	February & August.	4,000	4 00	....	....	
1854	GLOUCESTER	Mass.	40,000	50	—	January & July.	5,000	3 50	....	....	
1857	GLOVERSVILLE	N. Y.	15,000	25	—	Do.	3,000	3 50	....	....	
1858	GRAND RAPIDS	Mich.	50,000	20	—	Do.	3,000	4 00	....	....	
1855	GREAT BARRINGTON	Mass.	5,000	100	5	April & October.	2,000	7 00	....	....	
1849	GREAT FALLS	N. H.	50,000	100	3	Do.	3,000	4 00	....	....	
1860	GREENFIELD	Mass.	20,000	50	2	January & July.	2,500	4 00	....	....	
1853	GREENPOINT	N. Y.	100,000	50	5	Do.	20,000	3 00	....	....	Close corporation.
1859	GREENSBORO'	N. C.	12,000	50	—	April & October.	3,000	7 00	....	....	
1858	GREENSBURG	Pa.	30,000	25	3	May & November.	2,000	3 00	....	....	
1854	HAGERSTOWN	Md.	15,000	20	—	January & July.	2,000	6 00	....	....	
1859	HAMILTON	O.	15,000			Do.			....	....	
1857	HANNIBAL	Mo.	100,000	100	—	Do.	6,000	3 50	....	....	
1855	HARLEM	N. Y.	350,000	50	3½	Do.	25,000	3 00	....	145	
1849	HARRISBURG	Pa.	100,000	—	4	Do.	5,000	4 00	....	....	
	HARTFORD	Ct.	200,000	25	4	Do.	25,000	3 00	150	140	Stock in demand.
1858	HASTINGS	N. Y.				Do.	8,000	4 00	....	....	
1859	HAVERHILL	Mass.	50,000	50	—	Do.	5,000	4 00	....	....	
1861	HAVERSTRAW	N. Y.	20,000	100	—	Do.	5,000	4 00	....	....	
1859	HAYESVILLE	Mass.	15,000	25		Do.	4,000	4 00	....	....	
1862	HEMPSTEAD	N. Y.	16,000	25	—	Do.	1,000	4 00	....	....	
1856	HOBOKEN	N. J.	100,000	25	3	Do.	30,000	2 50	....	100	Works not yet built.
1861	HOLLIDAYSBURG	Pa.	30,000	25	2	Do.	4,000	3 50	....	....	
1861	HOLYOKE	Mass.	20,000	25	—	Do.	3,000	4 00	....	....	
1854	HOMER & CORTLANDT	N. Y.	40,000	100	—	Do.	6,000	4 00	....	....	
1860	HONESDALE	Pa.	30,000	25	3	Do.	2,500	4 00	....	....	
1853	HORNELLSVILLE	N. Y.	12,000	50	—	Do.	2,000	4 00	....	....	
	HUDSON	N. Y.	50,000	100	3½	February & August.	3,000	4 00	....	....	
1857	HUNTER'S POINT	N. Y.									
1856	HUNTINGTON	Pa.	18,000	50	3	Do.	2,000	3 50	....	....	
	HUNTSVILLE	Ala.	7,325	25	—	June & December.	2,000	5 00	....	....	
	INDIANAPOLIS	Ind.	150,000	—	—	Do.	15,000	5 00	....	....	
1857	IOWA CITY	Iowa.	40,000	50	—	February & August.	4,000	4 50	....	....	
1852	ITHACA	N. Y.	75,000	25	3½	January & July.	6,000	4 00	....	....	
1857	JACKSON	Mich.	25,000	50	5	Do.	6,000	3 50	....	....	
	JACKSON	Miss.	80,000	50	—	Do.	4,000	4 50	....	....	
	JACKSON	Cal.	50,000	30	—	Do.	4,000	10 00	....	....	
	JACKSONVILLE	Flor.	30,000	20	—	Do.	2,000	7 00	....	....	
	JACKSONVILLE	Ind.	50,000	50	—	Do.	4,000	5 00	....	....	
1858	JACKSONVILLE	Mo.	25,000	25	—	Do.	7,000	6 00	....	....	
1856	JAMAICA	N. Y.	20,000	—	4	Do.	6,000	4 00	....	....	
1853	JAMAICA PLAIN	Mass.	75,000	100	3½	Do.	3,000	3 50	....	....	
	JAMESTOWN	N. Y.	25,000	—	—	Do.	4,000	4 00	....	....	
1856	JANESVILLE	Wis.	50,000	100	—	Do.	12,000	4 00	....	....	
	JEFFERSONVILLE	Md.	30,000	25		Do.	4,000	4 00	....	....	
1858	JERSEY CITY	N. J.	300,000	—	5	Do.	30,000	3 00	150	....	No sales since formation of Hoboken Co.
1856	JERSEY SHORE	Pa.	15,000	25	—	Do.	2,000	3 70	....	....	
1857	JOHNSTOWN	Pa.	80,000	25	3	Do.	8,000	3 00	....	....	
	JOLIET	Ill.	300,000	100	—	June & December.	6,000	4 00	....	....	
1858	KALAMAZOO	Mich.	30,000	50	5	Do.	10,000	4 00	....	....	
1860	KEENE	N. H.	60,000	100	—	Do.	4,500	4 00	....	....	
1855	KEOKUK	Iowa.	100,000	100	—	January & July.	10,000	4 50	....	....	
1855	KINGSTON	Pa.	50,000	50	—	Do.	3,000	4 00	....	....	
1859	KITTANNING	Pa.	20,000	—	—	Doubtful.	5,000	4 00	....	....	
1854	KNOXVILLE	Tenn.	63,000	—	—	April & October.	4,000	5 00	....	....	Said to be a fraud.
1860	LACONIA	N. H.	20,000	100	—	Do.	4,000	6 00	....	....	
1859	LA CROSSE CITY	Wis.	100,000	50	—	June & December.	10,000	5 00	....	....	
1854	LAFAYETTE	Ind.	60,000	50	4	January & July.	10,000	3 25	....	....	
1856	LAMBERTVILLE	N. J.	30,000	25	—	Do.	2,500	4 00	....	....	
1849	LANCASTER	Pa.	100,000	50	4	Do.	10,000	3 00	....	....	
1856	LANCASTER	O.	25,000	100	5	Do.	5,000	3 50	....	....	
1855	LANSINBURG	N. Y.	25,000	100	—	Private Works.	7,000	4 00	....	....	
1849	LAWRENCE	Mass.	200,000	100	4	February & August.	15,000	3 50	....	....	
1859	LEAVENWORTH	Kansas.	200,000	25	—	January & July.	10,000	5 00	....	....	
1856	LEBANON	Pa.	26,000	50	—	February & August.	5,000	4 00	....	....	
1861	LE ROY	N. Y.	25,000	50	—	Do.	4,000	4 00	....	....	
1858	LEWISBURG	Pa.	20,000	100	—	January & July.	4,000	4 00	....	....	
1852	LEWISTON	Me.	100,000	100	3	Do.	10,000	3 20	....	....	
1856	LEWISTOWN	Pa.	30,000	50	3	April & October.	3,000	3 10	....	....	
1853	LEXINGTON	Ky.	100,000	25	4	January & July.	5,000	4 00	....	....	
1853	LITTLE FALLS	N. Y.	112,000	25	—	Do.	3,500	7 00	....	....	
1861	LITTLE ROCK	Ark.	20,000	—	—	Do.	5,000	6 00	....	....	
1858	LOCKHAVEN	Pa.	28,000	—	—	Do.	3,000	4 00	....	....	
	LOCKPORT	N. Y.	100,000	50	—	Do.	4,000	4 00	....	....	
1838	LOUISVILLE	Ky.	600,000	50	6	Do.	80,000	2 50	125	....	But $481,400 stock has been sold. This Company has a large contingent fund and undivided profit on hand.
1849	LOWELL	Mass.	200,000	25	5	Do.	50,000	3 25	....	....	
1852	LYNCHBURG	Va.	70,000	25	5	Do.	6,000	3 80	....	....	
1852	LYNN	Mass.	55,000	50	4	Do.	20,000	4 00	....	....	
1859	LYONS	N. Y.	30,000	100	—	Do.	4,000	4 00	....	....	
1852	MACON	Ga.	75,160	25	6	Do.	5,000	5 00	....	....	
1851	MADISON	Ind.	160,000	25	3	Do.	10,100	3 50	....	....	
1855	MADISON	Wis.	100,000	25	—	Do.	5,000	5 00	....	....	
1854	MALDEN & MELROSE	Mass.	50,000	25	3	February & August.	5,000	4 00	....	....	
1852	MANAYUNK	Pa.	40,000	100	—	Do.	7,000	4 00	....	....	
1852	MANCHESTER	N. H.	100,000	100	5	January & July.	25,000	3 00	....	....	
1830	MANHATTAN (N. Y. City)	N. Y.	4,000,000	50	5	Do.	600,000	2 50	300	375	
	MANSFIELD	O.	25,000	—	—	Do.	10,000	4 00	....	....	
1854	MARBLEHEAD	Mass.	40,000	100	3	Do.	1,000	4 00	....	....	
	MARLBORO'	Mass.	20,000	—	—	Do.	8,000	4 00	....	....	
	MAUCH CHUNK	Pa.	50,000	50	—	Do.	7,000	4 00	....	....	
1857	MARIETTA	O.	50,000	50	—	Do.	7,000	4 00	....	....	
1860	MARION	O.	12,000	25	5	April & October.	1,500	3 55	....	....	Stock firm.
1858	MARYSVILLE	Cal.	50,000	100	—	January & July.	4,000	12 50	....	....	
1857	MASSILON	O.	20,000	25	—	Do.	5,000	3 00	....	....	
1855	MEADVILLE	Pa.	39,500	25	—	Do.	4,000	3 50	....	....	
	MEDINA	N. Y.	2,000	100	—	Do.	2,000	7 00	....	....	
1852	MEMPHIS	Tenn.	300,000	100	5	June & December.	12,000	3 50	....	....	
	MERIDEN	Ct.	20,000			Do.			....	....	
1859	METROPOLITAN (N. Y. City)	N. Y.	1,000,000	100	—	January & July.	200,000	2 50	....	....	
1859	MIDDLEBORO'	Mass.	15,000	—	—	Private Works.		6 00	....	....	
1853	MIDDLETOWN	Ct.	50,000	25	3	March & September.	5,000	3 80	....	....	
	MIDDLETOWN	N. Y.		25	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
	MILFORD	Mass.	20,000	—	—	Do.		4 00	....	....	
	MILLEDGEVILLE	Ga.	100,000	50	—	Do.		5 00	....	....	
	MILTON	Pa.	10,000			Do.			....	....	
1847	MILWAUKEE	Wis.	400,000	50	5	January & July.	24,000	3 50	150	....	
1852	MOBILE	Ala.	200,000	—	—	Do.	30,000	4 50	....	....	
1836	MONROE	Mich.	40,000	50	—	Do.	5,000	3 50	50	....	
1852	MONTGOMERY	Ala.	100,000	25	4	February & August.	7,000	6 00	....	....	
1856	MONTPELIER	Vt.	30,000	25	3	January & July.	5,000	4 50	....	....	
1859	MORRISANIA	N. Y.	30,000	50	—	Do.		4 00	....	....	
1859	MORRISTOWN	N. J.	18,000	50	—	Do.	3,500	4 00	....	....	
1854	MOUNT HOLLY	N. J.	16,650	25	3	April & October.	2,000	7 00	....	....	
	MOUNT VERNON	O.	50,000	100	—	Do.		4 00	....	....	
1857	MUSCATINE	Iowa.	50,000	100	—	January & July.	3,000	4 50	....	....	
1854	NANTUCKET	Mass.	50,000	100	3	February & August.	6,000	4 00	....	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1852	NASHUA	N. H.	45,000	50	3½	January & July.	10,000	3 50	....	....	
1850	NASHVILLE	Tenn.	200,000	50	5	Do.	25,000	3 50	....	....	
1858	NATCHEZ	Miss.	46,000	50	—	Do.	20,000	5 00	....	....	
1852	NEW ALBANY	Ind.	200,000	50	3½	Do.	16,000	3 50	....	....	
1846	NEWARK	N. J.	362,000	50	5	Do.	45,000	3 62	130	....	Always a favorite stock.
1856	NEWARK	O.	30,000	100	—	Do.	7,000	5 40	....	....	
1852	NEW BEDFORD	Mass.	130,000	100	5	Do.	15,000	2 90	102	....	Well managed and kept quiet.
1859	NEWBERN	N. C.	22,000	100	6	Do.	6,000	3 50	....	....	
	NEW BRITAIN	Ct.	30,000	20	5	Do.	8,000	4 00	....	....	
1851	NEW BRUNSWICK	N. J.	100,000	20	4	Do.	8,000	3 00	115	....	
1852	NEWBURG	N. Y.	67,000	20	4	Do.	10,000	4 00	105	....	
1852	NEWBURYPORT	Mass.	150,000	10	4	Do.	9,000	4 00	92½	....	
1857	NEWCASTLE	Del.	32,300	10	3	Do.	4,000	4 00	90	....	
1847	NEW HAVEN	Ct.	250,000	25	4	Do.	30,000	3 00	155	....	None in market.
1853	NEW LONDON	Ct.	70,000	50	3	Do.	12,000	4 00	105	....	Do.
1835	NEW ORLEANS	La.	1,500,000	100	6	Do.	120,000	4 00	180	....	
1853	NEWPORT	R. I.	130,200	100	4	Do.	10,000	3 50	112	....	
1854	NEWTON & WATERTOWN	Mass.	300,000	100	2	Do.	10,000	4 00	....	....	
	NEWTON	N. J.	30,000	—	—	Do.	3,000	4 00	....	....	
	NEWTON	Pa.	20,000	50	—	Do.	2,000	4 00	....	....	
1823	NEWTOWN	N. Y.									
1839	NEW YORK	N. Y.	1,000,000	50	5	May & November.	100,000	2 50	300	....	
	NIAGARA FALLS	N. Y.	15,000	25	—	Do.	3,000	4 00	90	....	
	NORFOLK	Va.	60,000	25	—	Do.	40,000	4 00	....	....	
1853	NORRISTOWN	Pa.	41,700	25	4	June & December.	8,000	3 50	....	....	
1855	NORTH ATTLEBORO'	Mass.	50,000	100	3½	Do.	6,000	4 00	....	....	
	NORTHERN LIBERTIES	Pa.	400,000	25	7	City Works.	40,000	2 50	....	....	
	NORTH ADAMS	Mass.	25,000	—	—	March & September.	30,000	4 00	....	....	
1856	NORTHAMPTON	Mass.	35,000	25	3	January & July.	4 500	4 00	....	....	
1859	NORTH BRIDGEWATER	Mass.	16,000	100	4	June & December.	1,000	7 00	....	....	
1856	NORWALK	Ct.	30,000	150	4	February & August.	6,000	4 00	....	....	
1859	NORWALK	O.	30,000	25	—	January & July.	4,000	4 00	....	....	
1854	NORWICH	Ct.	75,000	25	3½	Do.	12,000	3 50	....	....	
1861	NORWICH	N. Y.	12,000	50	—	Do.	2,500	4 00	....	....	
1859	NYACK	N. Y.	20,000	100	—	Do.	2,500	4 00	....	....	
1860	OBERLIN	O.	10,000	—	—	Do.	1,200	4 00	....	....	
1855	OGDENSBURG	N. Y.	75,000	50	5	Do.	9,000	4 00	....	....	
1859	ORANGE	N. J.	65,000	25	—	Do.	6,000	3 50	....	....	
1852	OSWEGO	N. Y.	81,250	100	3½	Do.	15,000	4 00	105	....	Good works, built by Hoy, Jr., & Kennedy.
1855	OTTAWA	Ill.	45,000	100	6½	Do.	6,000	4 00	....	....	
1856	OWEGO	N. Y.	40,000	50	3½	Do.	5,000	4 00	....	....	
1860	OWENSBORO'	Ky.	25,000	25	—	Do.	4,000	3 50	....	....	
1856	PADUCAH	Ky.	75,000	100	—	May & November.	4,000	5 00	....	....	
1861	PAINSVILLE	O.	40,000	25	5	Do.	2,500	5 00	....	....	
1856	PALMYRA	N. Y.	12,000	25	—	January & July.	3,000	7 00	....	....	
1847	PATERSON	N. J.	125,000	25	3	Do.	20,000	3 50	95	....	
1850	PAWTUCKET	R. I.	75,000	50	4	Do.	12 000	3 00	....	....	
1855	PEEKSKILL	N. Y.	31,000	50	3	June & December.	4,000	4 00	....	....	Surplus $10,000, May 15, 1863.
1860	PENN YAN	N. Y.	12,000	50	5	Do.	3,000	4 00	....	....	Works leased to Gilbert T. Sutton.
1859	PEOPLES', CHICAGO	Ill.	500,000	50	New	Do.	100,000	2 50	....	....	
1855	PEORIA	Ill.	100,000	50	4	Do.	8,000	3 50	....	....	What is this Company doing?
1852	PETERSBURG	Va.	120,000	—	5	January & July.	20,000	3 80	....	....	
1841	PHILADELPHIA	Pa.	3,000,000	50	—	City Works.	650 000	2 00	....	....	
1855	PIQUA	O.	50,000	50	—	January & July.	6,500	4 00	....	....	
1835	PITTSBURG	Pa.	300,000	100	5	Do.	60,000	1 50	115	....	
1854	PITTSFIELD	Mass.	50,000	100	5	Do.	4,500	4 00	....	....	
1858	PLACERVILLE	Cal.	30,000	50	—	Do.	4,500	10 00	....	....	
1860	PLAINFIELD	N. J.	25,000	50	—	Do.	2,500	4 00	....	....	
1859	PLATTSBURG	N. Y.	16,000	50	—	January & July.	5,000	7 00	....	....	
1853	PLYMOUTH	Mass.	40,000	100	—	April & October.	8,000	4 00	....	....	
1860	PORT CHESTER	N. Y.	50,000	50	—	Do.	4,000	4 00	....	....	
1860	PORT JERVIS	N. Y.	20,000	100	—	Do.	3,000	4 10	....	....	
1849	PORTLAND	Me.	300,000	50	4	January & July.	30,000	3 00	....	....	
1859	PORTLAND	Oreg.	50,000	50	—	Do.	3,500	8 00	....	....	
1859	PORT LAVACCA	Texas.	50,000	100	—	Do.	2,500	7 00	....	....	
1851	PORTSMOUTH	N. H.	70,000	100	8	April & October.	6,500	3 70	....	....	
1855	PORTSMOUTH	O.	50,000	50	4	January & July.	10,000	3 50	....	....	
1855	PORTSMOUTH	Va.	100,000	50	4	Do.	4,000	4 00	....	....	
1856	POTTSTOWN	Pa.	20,000	50	3	Do.	3,500	4 00	....	....	
1850	POTTSVILLE	Pa.	110,000	50	2	Do.	10,000	3 50	....	....	
1850	POUGHKEEPSIE	N. Y.	84,000	25	4	March & September.	15,000	3 50	120	110	
1848	PROVIDENCE	R. I.	1,000,000	50	4	January & July.	60,000	3 00	122	....	
1853	QUINCY	Ill.	300,000	50	4	June & December.	12,000	3 50	....	....	
	QUINCY	Mass.	00,000	00	—	Do.	00,0 0	0 00	....	....	
1855	RACINE	Wis.	43,500	26	—	Do.	7,000	3 50	....	....	
1857	RAHWAY	N. J.	50,000	20	—	January & July.	5,000	4 00	....	....	
1858	RALEIGH	N. C.	25,000	100	6	May & Novrmber.	5,000	6 00	....	....	
1848	READING	Pa.	100,000	25	4	January & July.	25,000	3 00	....	....	
1851	RICHMOND	Va.	341,975	—	—	City Works.	30,000	3 00	....	....	
1859	RICHMOND	Mass.	40,000	25	—	January & July.	3,000	4 00	....	....	Jeff. Davis has extinguished the gas-lights of Richmond, Va.
	RICHMOND COUNTY	N. Y.									
1859	RIPLEY	O.	30,000	50	—	Do.	2,000	4 50	....	....	
1852	ROCHESTER	N. Y.	200,000	50	5	Do.	50,000	2 50	....	....	
1857	ROCKFORD	Ill.	40,000	50	—	Do.	4,000	4 00	....	....	
1854	ROCK ISLAND	Ill.	100,000	50	—	Do.	6,000	4 50	....	....	
1854	ROCKLAND	Me.	50,000	100	—	Do.	6,000	4 40	....	....	
1852	ROME	N. Y.	35,000	100	3½	Do.	10,000	3 60	....	....	
1854	RONDOUT and KINGSTON	N. Y.	65,150	20	3½	June & December.	10,000	3 80	....	....	
1854	ROXBURY	Mass.	150,000	100	5	January & July.	20,000	3 50	....	....	
1859	RUTLAND	Vt.	20,000	25	—	Do.	4,000	3 50	....	....	
	SACO	Me.	71,600	100	3½	April & October.	8,000	4 00	....	....	
1857	SACRAMENTO	Cal.	500,000	100	—	Do.	40,000	10 00	....	....	
1850	SAG HARBOR	N. Y.	20,000	—	—	Do.	4,000	4 00	....	....	
1858	SAINT ALBANS	Vt.	15,000	20	—	Do.	3,000	7 00	....	....	
	SAINT JOHNSBURY	Vt.	30,000	25	—	Do.	4,000	4 00	....	....	
1857	SAINT JOSEPH	Mo.	50,000	100	5	January & July.	6,000	5 00	....	....	
1839	SAINT LOUIS	Mo.	600 000	50	—	June & December.	180,000	3 50	....	....	
1857	SAINT PAUL	Min.	200,000	50	3	January & July.	10,000	6 00	....	....	Surplus $10,000, May 15, 1863.
1856	SALEM	N. J.	30,000	25	3	Do.	5,000	3 86	....	....	
1850	SALEM	Mass.	200,000	100	4	February & August.	30,000	3 24	....	....	
1859	SALEM	O.	25,000	20	—	Do.	3,000	3 00	....	....	
1859	SALISBURY	N. C.	14,600	50	6	May & November.	8,500	6 00	....	....	
	SALISBURY MILLS	Mass.	1,250	25	—	Do.	3,000	4 00	....	....	
	SALMON FALLS	Me.	25,000	100	—	Do.	3,000	4 00	....	....	
	SAN ANTONIO	Texas.	75,000	20	—	Do.	40,000	6 00	....	....	
	SAN DIEGO	Cal.	30,000	50	—	Do.	50 000	10 00	....	....	
1854	SANDUSKY	O.	75,000	50	—	April & October.	9,000	3 00	....	....	
1859	SANDWICH	Mass.	10,000	—	—	Private Works.	2,000	3 50	....	....	
1852	SAN FRANCISCO	Cal.	1,000,000	100	6	Do.	50,000	8 00	110	....	
1853	SARATOGA SPRINGS	N. Y.	39,000	100	—	January & July.	6,000	3 60	70	....	
	SAUGERTIES	N. Y.	30,000	20	—	Do.	4,000	3 00	....	....	
1849	SAVANNAH	Ga.	200,000	25	5	Do.	10,000	3 75	....	....	
1851	SCHENECTADY	N. Y.	50,000	—	—	Private Works.	11,000	4 00	....	....	
1858	SCRANTON, Gas and Water	Pa.	100,000	25	—	January & July.	6,000	3 80	....	....	About trying Water-Gas.
1857	SELMA	Ala.	20,000	100	—	Do.	2,000	5 00	....	....	
1856	SENECA FALLS and WATERLOO	N. Y.	80,000	50	3	Do.	10,000	4 00	100	....	
	SHREVEPORT	La.	40,000	25	—	Do.	3,000	0 50	....	....	
1856	SING SING	N. Y.	40,000	100	—	Do.	3,000	3 50	....	....	
	SMYRNA	Del.						4 00	....	....	Petroleum Gas.
1860	SOUTH ADAMS	Mass.	10,000	25	—	Do.	3,000	4 00	....	....	
1859	SOUTH BRIDGE	Mass.	5,000	25	—	Do.	4,010	6 00	....	....	
	SOUTH BOSTON	Mass.	200,000	50	—	Do.	60,000	3 25	110	....	
	SPRINGFIELD	O.	200,000	100	—	Do	20,000	3 50	....	....	
1854	SPRINGFIELD	Ill.	75,000	50	—	January & July.	10,000	3 50	....	....	
1848	SPRINGFIELD	Mass.	100,000	500	5	February & August.	10,000	3 60	140	....	
1855	STAMFORD	Ct.	6,250	25	5	April & October.	3,000	3 50	....	....	
1857	STATEN ISLAND	N. Y.	150,000	50	5	January & July.	26,000	4 00	95	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	Staunton	Va.	18,000	50	6	January & July.	4,000	7 00	....	....	
	Steubenville	O.	150,000	100	—	Do.	15,000	4 00	....	....	
	Stockton	Cal.	50,000	—	—	Do.	8,000	10 00	....	....	
1848	Syracuse	N. Y.	125,000	25	5	March & September.	25,000	3 00	112	....	
	Tamaqua	Pa.	40.000	25	—	Do.	3,000	4 00	...	....	
1859	Tarrytown and Irvington	N. Y.	70,000	50	—	January & July.	3,000	4 00	....	....	
1853	Taunton	Mass.	100,000	50	4	Do.	10,000	4 00	....	....	
	Terre Haute	Ind.	100,000	100	—	Do.	3,000	4 00	....	....	
	Thompsonville	Ct.	25,000	50	—	Do.	4,000	4 50	....	....	
	Tiffin	O.	25,000	20	—	Do.	4,000	4 00	....	....	
1853	Toledo	O.	100,000	50	3	Do.	8,000	3 50	....	....	
1847	Trenton	N. J.	100,000	20	4	Do.	15,000	3 42	....	110	
1848	Troy	N. Y.	200,000	100	4	June & December.	35,000	3 00	160	....	
1856	Urbana	O.	30,000	25	—	April & October.	3,500	4 00	....	....	
1849	Utica	N. Y.	80,000	100	4	Do.	22,000	3 60	....	....	
1853	Vicksburg	Miss.	66,000	50	—	March & September.	4,000	4 50	....	....	
1859	Vincennes	Ind.	25,000	100	—	January & July.	2,000	4 00	....	....	
1858	Walden	N. Y.	2,500	—	—	Private Works.	1,000	6 00	....	....	
1853	Waltham	Mass.	100,000	100	4	January & July.	3,000	4 00	....	....	
1857	Ware	Mass.	30,000	20	—	Do.	3,500	4 00	....	....	
1861	Warren	O.	30,000	50	—	Do.	4,000	3 00	....	....	
1854	Warren	R. I.	20,000	25	—	Do.	3,000	4 00	....	....	
1855	Washington	D. C.	500,000	20	5	Do.	50,000	2 61	150	148	
1859	Washington	N. C.	15,000	100	—	April & October.	1,500	6 00	....	....	
1848	Washington	Pa.	20,000	25	4	January & July.	4,000	3 00	....	....	
1854	Waterbury	Ct.	100,000	25	—	Do.	4,000	4 00	....	....	
1852	Waterford	N. Y.	12,000	25	—	Do.	4,000	4 00	....	....	
1852	Watertown	N. Y.	20,000	100	—	Do.	10,000	7 00	....	....	
1856	Watertown	Wis.	25,000	100	—	Do.	5,000	5 00	....	....	
1858	Wautoma	Wis.	30,000	50	—	Do.	3,000	4 50	....	....	
1857	Waverly	Miss.	20,000	100	—	April & October.	4,000	5 00	....	....	
1854	West Cambridge	Mass.	60,000	100	—	February & August.	10,000	4 00	....	....	
1852	Westchester	Pa.	100,000	25	2½	Do.	3,500	3 50	....	....	
	Westfield	Mass.	25.000	100	6	Do.	4,000	4 00	....	....	
	Weston	O.	20,000	25	—	Do.		5 00	....	....	
1857	West Point	N. Y.	50,000	—	—	United States Military	Academy.	2 00	....	....	
1853	West Troy	N. Y.	100,000	50	3	January & July.	10,000	3 60	85	....	
1850	Wheeling	Va.	75,000	25	6	Do.	12,000	2 70	....	....	
	White Plains	N. Y.	20,000	20	—	Do.			....	....	
1856	Wilkesbarre	Pa.	50,000	50	—	May & November.	4,000	3 33	100	80	
1850	Williamsburg	N. Y.	1,000,000	50	5	January & July.	60,000	3 00	....	....	
1858	Williamsburg	Va.	30,000	25	—	Do.	3,000	4 00	....	....	Camp-fires of the Union Army light up this place at present.
1857	Williamsport	Pa.	70,000	25	4	Do.	3,500	3 80	....	....	
1859	Willimantic	Ct.	12,000	—	—	Do.	2,500	3 50	....	....	
1853	Wilmington	N. C.	60,000	50	5	Do.	8,000	5 00	....	....	
1852	Wilmington	Del.	200,000	50	5	February & August.	20,000	3 00	....	....	
1854	Winchester	Va.	86,000	50	6	January & July.	5,000	4 00	....	....	
	Windsor	Vt.									
	Woburn	Mass.	20,000	—	—	Do.	3,000	4 00	....	....	
1856	Woodstock	Vt.	10,000	50	4	Do.	4,000	6 00	....	....	
1853	Woonsocket	R. I.	82,600	100	4	April & October.	4,000	3 50	....	....	
1856	Wooster	O.	25,000	50	—	January & July.	6,000	3 00	....	....	
1849	Worcester	Mass.	160,000	100	5	Do.	15,000	3 50	....	....	
1855	Xesia	O.	40,000	50	—	Do.	3,000	4 00	....	....	
1854	Yonkers	N. Y.	75,000	50	3½	Do.	6,500	4 00	102½	....	
1849	York	Pa.	40,000	57	3	June & December.	10,000	3 50	....	....	
	Yorkville	S. C.	20,000	25	—	Do.	4,000	4 00	....	....	
1858	Ypsilanti	Mich.	20,000	50	5	February & August	6,000	14 00	....	....	
1850	Yreka	Cal.	30,000	100	—	Do.	2,000	0 00	....	....	
1848	Zanesville	O.	44,600	25	4	Do.	10,000	3 50	....	....	

GAS-LIGHT COMPANIES IN THE BRITISH PROVINCES OF NORTH AMERICA.

When Chartered.	Town.	Province	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1854	Belleville	C. W.	33,040	100	4	January & July.	1,200	5 00	....	....	
1854	Brantford	C. W.	32,000	100	2¼	Do.			....	....	
	Brockville	C. W.	50,000	—	—	Do.	5,000	4 00	....	....	
	Chatham	N. B.	50,000	—	—				....	....	
1854	Charlotte Town	P. E. I.	50,000	100	5	Do.	3,000	3 50	....	....	
1857	Cobourg	C. W.	30,000	—	-	February & August.	4,000		....	....	
	Dundas	C. W.	30,000	—	—	Do.	6,000	4 00	....	....	
	Frederick	N. B.	50,000	—	—	Do.			....	....	
1843	Halifax	N. S.	160,000	40	7	May.	30,000	3 00	....	....	
1850	Hamilton	C. W.	125,000	40	5	March & September.	20,000	3 50	....	....	
1848	Kingston	C. W.	80,000	100	—	Do.	6,000	3 50	....	....	
1853	London	C. W.	100,000	20	5	May & November.	5,000	5 00	....	....	
1847	Montreal	C. E.	400,000	40	—	March & September.	110,000	2 80	....	118	Last sale at this figure.
1854	Ottawa	C. W.	40.000	40	5	Do.	5,000	4 50	....	....	
1859	Point Levi	C. E.	25,000	25	—	January & July.	4,000	3 50	....	....	
1859	Port Hope	C. W.	28,000	20	4	May & November.	4,500	3 50	....	....	
1847	Quebec	C. E.	200,000	200	4	January & July.	60,000	3 00	....	....	
1848	Saint Catherine's	C. W.	80,000	20	—	May & November.	7,000	4 50	....	....	
1859	Saint Hyacinthe	C. E.	15.000	20	—	Do.	4,000	4 00	....	....	
	Saint John	N. B.	170,000	85	4	June & December.	25,000	3 00	110	110	Sales at this figure.
	Saint John's	N. F.	50,000	—	4	Do.	30,000		....	....	
1858	Sorel	C. E.	14,000	20	4	Do.	4,000	3 00	....	....	
1848	Toronto	C. W.	400,000	100	4	February & August.	50,000	3 33½	....	....	

GAS-LIGHT COMPANIES IN CUBA, MEXICO, SOUTH AMERICA AND NEW ZEALAND.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
	Callao	Chile.		—	—	January & July.	20,000	7 00	....	....	
	Cardenas	Cuba.	50,000	—	—	Do.	180,000	5 00	....	....	
1857	Compania Cubana	Hav'a.	500,000	500	10	Do.			....	....	
	Cienfugos	Cuba.		—	—	Do.	12,000	5 00	....	....	These four towns are lighted by the Compania Cubana of Havana.
	Guanabacoa	Cuba.		—	—	Do.	14,000	5 50	....	....	
	Regla	Cuba.		—	—	Do.	10,000	5 00	....	....	
	Trinidad	Cuba.		—	—	Do.	16 000	5 00	....	....	
	Guyaquil	S. A.	150,000	—	—	Do.	35,000		....	....	
	Havana	Cuba.	1,250,000	500	7½	Do.	300,000	5 00	....	....	
	Lima	Peru.	100,000	—	—	Do.	150,000		....	....	
	Maranham (Chartered)			—	—	Do.			....	....	
	Matanzas	Cuba.	50,000	—	—	Do.	180,000	8 50	....	....	
	Mexico City	Mex.	550,000	—	—	Do.			....	....	
	Montevideo	S. A.	500,000	—	—	Do.			....	....	
	Para (Chartered)			—	—	Do.			....	....	
1854	Rio de Janeiro	S. A.	1,000,000	500	7½	Do.	300,000	4 00	....	....	
	San Iago	Chile.	500,000	—	—	Do.	180,000	7 00	....	....	
1857	Saint Jago de Cuba	Cuba.	450,000	500	—	Do.	25,000	5 00	....	....	
	Valparaiso	Chile.	500,000	—	—	Do.	85,000	6 00	....	....	
	Vera Cruz	Mex	500,000	—	—	Do.			....	....	
	Vi le Clara	Cuba.	450,000	—	—	Do.			....	....	
	Auckland	N. Z.		—	—	Do.			....	....	

THE ALLEGED PETROLEUM NUISANCE AT LIVERPOOL.

In our last issue, under "Petroleum Items," we published an account of the alleged petroleum nuisance at Liverpool, England. A late number of the London *Grocer* has a more recent notice of the opinions of the Medical Officer of Health, which contains so much interesting matter, that we are tempted to quote it entire.

The Medical Officer of Health reports that on the waste land adjoining Love-lane, there 638 casks and 20 hogsheads, or thereabouts, of petroleum exposed to the open air, and that the petroleum is chiefly "crude Canadian;" that the operations of re-coopering and refilling the casks, are carried on in the open air: that there is, thence, a very considerable leakage, which, to a certain extent, is conveyed by surface channels to three wells; that, nevertheless, a large amount of petroleum has been washed by rains into the ground excavated for the building of a warehouse; that from this excavated ground, where it floats on the surface of water, petroleum is pumped into the channel of the street, and can be traced for about sixty yards, until it reaches the sewer near the corner of Stone street. The Medical Officer of Health considering that in this instance the usual precautions in storage have been neglected, certifies that it is a nuisance to be dealt with under the 27th clause of "The Nuisance Removal Act for England, 1855."

The Medical Officer of Health has heard it stated that there are practicable means by which the effluvia of petroleum can be prevented, and that those practicable means would be enforced on the trade if his certificate should declare petroleum a nuisance prejudicial to health. He need not state to the committee that the question with him is one of scientific and absolute truth, and not one of expediency. It is, therefore, one to be decided by evidence alone; but he may remind your committee that the enforcement of every practicable means for mitigating or removing the effluvia, short of the last resource of withdrawing all licenses, and thus driving the whole trade from the Mersey, can be ruled by the justices upon his certificate of its being a nuisance, independently of its being prejudicial to health.

The Medical Officer of Health, in his previous report, stated that he was prevented from thus certifying against all petroleum stores, solely because he was ignorant of any practicable means of remedying the evil, and because it would be unseemly in him to wield his official power needlessly and uselessly, to the annoyance, if not the injury, of the trade; but he now solicits chemists and mechanicians to make known to him or to members of the committee, any practicable suggestions for remedying the nuisance, assuring the committee that if any of the suggestions are practicable, he will place it in the power of the town clerk to bring the matter to an issue before the magistrates. But lest any persons should be distrustful of his judgment (aided, as it would be, by the great talent and professional experience of the borough engineer), in determining what is practicable or otherwise, he would suggest that the committee, in the prosecution against the owners of the petroleum in Love lane, invite practical men to prove to the justices that there are practicable means for preventing effluvia. The power rests with the justices to enforce all means which are practicable, and one ruling of the court of law will be a precedent to regulate the trade.

The Medical Officer reports on the memorial from residents of Scotland Ward, Everton, and Kirkdale, respecting petroleum, that he called on a number of the memorialists residing in Scotland road, and Great Mersey street, being the streets nearest the stores complained of, but could obtain no facts to alter the decision arrived at in his previous report.

The Medical Officer of Health reports on the memorial sent to the committee by Dr. Holcombe, and signed by ladies and gentlemen residing in Toxteth Park, that he called at the residences of all the memorialists; but, though he obtained many proofs of its being a nuisance, he could find no evidence to satisfy him that he could, with any prospect of success, bring them before the justices as examples of the prejudicial effect of petroleum on the health, or could, on their evidence, certify against the stores in the meaning of the Sanitary Act.

Your committee has placed in the hands of the Medical Officer of Health, two letters on this subject from medical men, which merit and require a few observations.

Dr. Holcombe says: "I consider petroleum to be not only a public nuisance, but one prejudicial to health. When I say prejudicial to health, I am not prepared to assert that it is prejudicial to the health of the strong, robust man, or to persons who are habituated to all kinds of abominable smells found in low, dirty, crowded districts; but that it is prejudicial to the health of numerous persons who are unaccustomed to breathe an atmosphere so tainted, and particularly to those whose constitutions are not strong, or who are of a nervous temperament."

Upon commenting upon this statement of Dr. Holcombe, exception must be taken *in limine*, against the implied physiological axiom, that the comparative immunity from evil effects acquired by those long and gradually exposed to one species of vitiated air, renders them less liable to suffer from the effects of impurities to which their constitutions have not been habituated; or, in other words, that because the poor are obliged to live in those dirty courts and alleys, the offensive stench of which disgusts the sensibilities of persons of more refined habits, that therefore they are less liable than the rich to suffer from a new deleterious agent. I am sure that such an assertion is not tenable either by physiological precepts or the deductions of experience. On the contrary, we find that when some new morbific ogent (material because obeying the laws of matter, though too subtle to be detected by the senses or analyzed by the chemist), that when some such miasm, whether it be that which generates typhus or cholera, or any zymotic disease, invades a community, it will find its victims among those "habituated to all kinds of abominable smells, in low, dirty, crowded districts" rather than among those "unaccustomed to breathe an atmosphere so tainted."

It is, therefore, evident that if the vapor of petroleum as it exists diluted in the atmosphere, be really a morbific agent, its effects are to be sought for among those living near newly erected petroleum stores, and also that if the percentage of sickness among those so placed be not greater than among the general community, it is impossible for any one, consistently with logical inference, to maintain that petroleum can be certified by your medical officer as prejudicial to health in the meaning of the Sanitary Act. It is necessary to guard my reasoning by this restriction—the meaning of the Sanitary Act; for I do not presume to doubt that there are many ladies and weakly men in whom the smell causes headache and nausea.

I know, indeed, the fact, familiar to all acquainted with drugs, that there are no scents, whether they arise from vegetable powder, as ipecacuanha; from vegetable secretions, as camphor, or from animal products, as musk, which do not produce similar effects on a number of persons.

I know the fact, familiar to all physicians, that the feeling called "disgust," whether influencing the nervous irritability through the mind, or through the senses of sight or smell, produces indirectly and by sympathy headache, nausea, vomiting, on a number of persons.

I also know that there are certain scents, innocuous and agreeable to the generality, which produce in others severe functional disease. This is observed in the instance of hay fever, occasioned by the smell of hay, whether in the open fields or in the mews.

Now, in all such instances it would not be denied that the subjective symptoms complained of were due to the causes alleged, nor that, to such extent, the offending agents were prejudicial to health; but it would be thought preposterous in any one to arraign them before the court in the terms and under the provisions of the Sanitary Act. When science treats of such cases, it records them under the title of idiosyncrasies, and does not generalize them under the normal effects of particular substances.

The other letter is from Mr. Samuel Hodgson, surgeon to the sick club of the Mersey Iron Works. He says, speaking from the observation of the residents of a street near the works: "I found that few escaped more or less nausea, headache, and loss of appetite; but that when the petroleum was newly stored, and a breeze passed over the depot, these symptoms became aggravated to frequent retching, loathing of food, and even vomiting." Again he says: "It is at once seen that the symptons produced by petroleum are chiefly subjective, but they are not less real on that account. Nor does the registrar's list of deaths bear any indication of their existence. They neither lapse into fever nor into any other zymotic diseases, but bear a closer affinity to the effects of sulphuretted hydrogen on the system."

There are two statements here which much surprised me. The fact is that the registrar's reports showed no indication of the continuance of a series of very aggravated symptoms due to petroleum, and therefore extending over months and years; symptoms so aggravated as to be placed by a member of the College of Surgeons in close affinity to those occasioned by sulphuretted hydrogen, the most deleterious and deadly of all poisonous gases. I know that poisoning with sulphuretted hydrogen, or with any analogous substance, will not lapse into zymotic disease; but I am equally certain that a population subject to the effects of deleterious gases for months and years, would become so weakened as to render them peculiarly liable to the miasm of any prevalent epidemic, and that hence the power of the injurious effects of existing gases or other morbific agents, is measured with certainty by the excess of epidemic diseases among the inhabitants. But since the registrar's reports were thus, *ab initio*, carefully excluded from the argument, I endeavored to test the effects of petroleum stores on the sick of the club of operatives thus reported to be suffering from the vapor. I asked, and obtained, by the courtesy of Mr. Clay, an interview with the secretary and treasurer of the club. I learned from them that the club consisted of about 700 operatives, and that the average of persons always absent from sickness, was between four and five per cent. The secretary mentioned that this percentage of sickness was at all times very equal, and had not increased since the establishment of the petroleum stores.

Both the secretary and treasurer assured me that, though they had heard the men complain of petroleum as nasty and disagreeable, they had never heard any one attribute to it sickness or ill-health.

The other statement in Mr. Hodgson's letter which surprised me, was the comparison of the symptoms which he himself describes with those produced by sulphuretted hydrogen.

The symptoms of his cases, in their aggravated form, are irritant, viz., "frequent retchings, loathing of food, and vomiting."

Sulphuretted hydrogen gas is a narcotic, producing, according to Dr. Christison and M. Halle, sudden weakness and all the signs of asphyxia, when in a concentrated form, and the symptoms of coma, or of coma and tetanic convulsions, when less concentrated.

When the atmosphere is but slightly contaminated with this poisonous gas, and when the symptoms produced by it are narcotico-irritant, they differ altogether from those attributed by Mr. Hodgson to petroleum.

The celebrated toxicologist, Mr. Taylor, thus describes the effects of the sulphuretted hydrogen as evidenced by the cases of workmen engaged in excavating the Thames Tunnel: "By respiring this atmosphere, the strongest and most robust men were, in the course of a few months, reduced to an extreme state of exhaustion, and several died. The symptoms, with which they were first affected, were giddiness, sickness, and general debility; they became emaciated, and fell into a state of low fever, accompanied by delirium."

Any comparison of the vapors of the hydrocarbons with so pernicious a gas as sulphuretted hydrogen, is an inexactitude of language and reasoning which ought to be avoided by professional men during the agitation of a scientific question of this importance.

They both contain sulphur, but there is no more logical sequence in the comparison than there was in Huellin's celebrated similitude between Monmouth and Macedon.

A letter from the Secretary of the Dock Board was read, stating that the Board was ready to meet any suggestion the Committee might make with regard to the petroleum on the quays.

The Fire Prevention Committee forwarded to this Committee a report from the head constable, calling attention to the want of water-supply on the carriage dock quays for extinguishing fires, and to the fact that large quantities of petroleum and timber were at present stored upon those quays, which rendered such provision the more imperatively necessary. The report stated that in No. 2 dock there were eight vessels, three of which were laden with 11,300 barrels of petroleum; and that on the north quay there were 8,822 barrels and 300 boxes of petroleum, and near this a considerable quantity of timber.

Communications complaining of a nuisance caused by the leakage of petroleum from 638 casks and 30 hogsheads, stored on the premises of Messrs. Young & Co., in Love lane; from Messrs. Roberts and Owen, complaining of a petroleum nuisance in Taylor street; and from Mr. Robert Lupton and others, complaining of similar nuisances in other parts of the town, were read.

It was stated that the Fire Prevention Committee had commenced proceedings against Messrs. Young & Co., to compel them to store the petroleum in the manner prescribed by the by-laws.

Mr. Stitt said he had seen an iron cask, which, he believed, would hold petroleum without the possibility of leakage, and he thought they ought to take steps to compel dealers to use that cask.

Dr. Trench said he had made inquiries about the cask in question (Cope's patent), and he was given to understand that iron casks had been extensively used, but that it had been found that the competition brought bad material into the market, and that cracks in the casks were the consequence, resulting in a far greater nuisance and loss than leakage from wooden casks. Apart from this, they had no power to compel importers to bring petroleum to this country in those casks, and any attempt to transfer it from wooden to iron casks, after its arrival in this country, would cause ten times more evil than the present system.

The Law Clerk observed that until they could go into court and prove that better means existed for counteracting this evil than any now in use, any attempt to prosecute for a nuisance must fail; because the information must be laid for neglecting to adopt proper precautions. The prosecution instituted by the Fire Prevention Committee, would only compel the persons to place the petroleum in a proper shed, according to the by-laws, without in any way dealing with the larger question; and if the petroleum should still be offensive when placed in such sheds, it would still be necessary to inquire what could be done.

The subject was then allowed to drop, the Committee deciding to defer its further consideration until the result of the proceedings taken by the Fire Prevention Committee should be known.

SUBSEQUENT REPORT.

The above having given rise to considerable discussion, the following report was prepared and submitted to the Board by Dr. Trench:

It is most important for the comfort of the inhabitants of the northern and southern districts of the town, that this question should be settled, and that the justices should be asked to determine the extent to which interference with the storage of petroleum may be exercised by the officers of your Committee.

The Medical Officer of Health having obtained from the Building Surveyor a list of all the licensed petroleum sheds, proceeded to inspect them, and now reports to your Committe:—1st. That in all of them there was a very considerable leakage from the casks; 2d. That in all of them the floors were perfectly saturated with the escaped oil.

The Medical Officer of Health reports that in four instances he found evidence of considerable quantities of oil having been spilt in the open streets.

He found in the gutter channel of the street before Molyneux's sheds, Sefton street, a collection of water, upwards of 150 yards in length, and three feet in breadth, the whole surface of which, extending from the north end of the sheds to the sewer opposite the timber yard of Messrs. Jones & Quiggin, was covered and iridescent with floating oil. The street opposite the sheds was apparently saturated with oil.

He found in the thoroughfare opposite Bury and Kennedy's sheds, in Love lane, the indications of a considerable quantity of spilt petroleum, while in the yard attached to the warehouse, the oil was seen floating on stagnant water. In this yard, 100 casks of crude petroleum were exposed to the open air.

He found before Howson's shed, Forge street, marks of petroleum spilt during the re-coopering the casks, and he observed in Howson's shed, Grundy street, a man removing sand saturated with oil and throwing it on the vacant ground near the railway.

The Medical Officer of Health, considering it most necessary that some rules of supervision in regard to petroleum stores, should be obtained from the justices, has determined to certify against the two largest of these warehouses.

Therefore, in pursuance of the Nuisances Removal Act for 1855, section 27, the Medical Officer of Health formally certifies that the building called Molyneux's sheds, in Sefton street, and the building called Bury and Kennedy's sheds, in Love lane, respectively, used for the the business of warehousing petroleum, are nuisances.

The Medical Officer of Health has assumed the invidious task of thus selecting two warehouses with the less reluctance, as his object in certifying is simply to obtain from the justices rules to regulate the storage of the oil.

He believes that it can be proved—

1. That petroleum stores, as at present managed, are a public nuisance.

2. That improvements in storage are practicable and urgently required.

3. That all the casks leak to a considerable extent, and that the casks employed for the cheap crude oil are of worse construction than those used for distilled and more valuable oils.

4. That there is nothing beyond increased expense to prevent oils of every description being dealt with so as to prevent leakage.

5. That warehouses as at present constructed with floors of brick over sand, do, by preventing the leakage being seen, encourage neglect in storage.

6. That all petroleum warehouses ought to have non-absorbing flooring, so that leakage can be at once detected; for

7. The leaking into the floors, as at present constructed, is so great that it must reach the surface ground of the neighborhood.

8. The Medical Officer of Health believes that if all these simple data are proved, the justices will, as in all similar cases of prosecution under the Nuisances Removal Act, direct the best practicable means to be used for the abatement of the nuisance.

THE ARRANMORE, IRELAND, LIGHTHOUSE.—The lantern for the Lighthouse of Arranmore, of the coast of Donegal, Ireland, has just been completed. It is a huge sixteen-sided structure, covered with a copper dome, and surmounted by a ball, supplied with ventilators, and bearing a wind vane representing an arrow. The height of the lantern, from its base to the ball, is 30 feet, and its diameter is 15 feet. The Dublin *News Letter*, in describing it, says, that one would be inclined to believe it a large portable house. This lantern will stand on a solid mason-work tower, of 55 feet high, which will make the elevation of the light nearly 85 feet. The floor of the lantern is composed of pieces of metal weighing 16 tons, all jointed together with the greatest precision. From this flooring rises a metal wall, presenting sixteen sides. From this wall the lantern springs, which is composed of forty-eight compartments, divided by bars of gun metal grooved to receive plate-glass three-eighths of an inch in thickness. The uprights sustaining the dome are of planed iron, pointed with gun-metal astragals. The lantern is entered by means of an air-tight door, which will open on the platform of the tower, into which the lantern will be built and bolted down. The metal walls are lined with polished mahogany, in which ventilators are inserted. A curved metal stairway leads to an open ironwork gallery surrounding the apartment at half its height. This gallery will be used for serving and tending the light, which will be a revolving one, and of the first order. Inside the dome, a circle of iron is introduced, from which the T-iron that will support the apparatus for sustaining the light will spring.

INTERIOR OF A LONDON SEWER.

The London *Daily News* furnishes the following description of the remarkable works now in course of completion for carrying off the sewage matter of the metropolis: "The grand reservoir which is in course of construction, is six acres in extent, and connected with it are three series of channels, one above the other, the lowest one bringing down sewage from the sewer to the pumping-well; the upper channel conveys it, after being pumped up, into the reservoir, and the middle one carries the sewage from the reservoir into the river. The visitors were first conducted down many steps to a long arcade of brick, well lighted with candles, and this is intended to carry off the storm waters, in the event of an overflow, direct into the river. It is eight feet below low water. Passing from this, another arcade was reached; this is the main culvert; taking the sewage to the east pump, and there is a similar one going to the west pump. These culverts, as they are called, are sufficiently large for a railway train to run through, and a regiment of Life Guards might canter through them easily. Following the labyrinth, we next come to an immense porticullis of iron, which opens on massive hinges secured in solid masonry. These are to act as seives or strainers for the sewage before it reaches the pump-well. Dead dogs and cats, and all the coarse and miscellaneous kind of refuse which find their way into the large sewers, will be arrested at these massive portals, and will be deposited in a large stone prison, the bottom of which is scooped or curved. Within these stone wells a huge wheel filled with buckets, will constantly revolve, acting as a dredging apparatus, to drag up out of this dark abyss, called the 'filth hoist,' all the sediment and arrested particles brought down by the sewer. They will be deposited by the revolving buckets in the 'filth chamber,' whence they will pass into the river at low tide. Passing the gates we enter the pump-room, the bottom of which is seventeen feet below low-water mark. Here will be four engines, of 125-horse power each, which will pump continuously into the reservoir. A portion of iron-work for the reception of these engines is placed in position. Following the course of the culverts, we next pass into the reservoir which is to hold the sewage water until it can be discharged into the river. This, as we have just stated, covers an area of six acres. It will have a roof formed of brick arches, resting upon brick piers, and its floor is Portland stone. These six arches of immense cellerage, when full, will contain twenty millions of gallons. It is not yet roofed in, but the piers are nearly all completed, and they stand in long rows, crossing and intersecting each other, a perfect forest of brick-work. Twice in the day the outlet from this vast receptacle will be opened to the river, and for two hours at the ebb after high water, the contents will flow into the river. Though the pumps will send in continuous streams of sewage, the reservoir will only be cleared out twice in the day. With a view of preventing any sediment accumulating in the bottom, there is a large tunnel on the land side, which, when the reservoir is full, will also be filled with water, and as soon as the reservoir has poured its contents into the river, the flood-gates of this tunnel will be opened, and its waters rushing out will wash away the deposit. We may add that the reservoir will be divided into three compartments, so fitted with sluices, and penstocks, and other contrivances, as that each may be used separately as well as together, and afford facilities for repairs when needed. Passing to the next stage, we proceed along another road of similar size to that already traversed, brick sides with iron girders carrying the brick roof, and which forms the main culvert delivering the sewage from the reservoir into the river, through a series of arched openings of about four feet in height."

SING SING, N. Y.—The Sing Sing, N. Y., gas company have reduced the price of their gas from $4 to $3 50 per 1,000 cubic feet. This company also pay the government tax.

GAS IN WALES.—The Cardiff Gas-Light and Coke Company have held their 53d half-yearly meeting, and have further reduced the price of their gas 3d. per thousand cubic feet. The price is now 3s. 3d. per thousand to small consumers.

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

LIGHT, HEAT, WATER-SUPPLY AND SEWERAGE.

Its purpose is to ascertain and make known all new discoveries in the science and economical application of LIGHT, and promote thereby the interests of companies and consumers; to encourage and aid the introduction of PURE WATER from Lakes and Rivers into Towns and Cities, and to improve the system of SEWERAGE, VENTILATION, HEATING, and DRAINAGE everywhere.

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THE

AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

C. ELTON BUCK, ... EDITOR.

THURSDAY, OCTOBER 1, 1863.

On page 93 of the last number of the JOURNAL, we printed an abstract of a paper on Superheated "Steam and Coal Tar," read at the recent meeting of the Association of Gas Managers of Scotland, by Mr. ROBERT GRAY, Manager of the Dunfermline Gas-Works. At the same meeting, another paper, interesting to gas-engineers, was read: the subject being, "An Improvement in the Working of the Hydraulic Main." Mr. THOS. WHIMSTER, engineer of the Perth Gas-Works, was the author of the latter paper, which embraced an account of various experiments he had tried, in order to simplify the working of the main, and to prevent those obstructions in the dip-pipes, which will occasionally happen, even in the best regulated works.

Mr. WHIMSTER found that when carbonizing at a cherry red heat, the ascension pipes would be occasionally choked up; and that when the heats were raised to anything like whiteness, the obstructions were more frequent, and that there was not only a loss of labor in cleaning them, but that considerable quantities of gas escaped during the operation. These results being annoying in the extreme, Mr. WHIMSTER set about trying a number of experiments to ascertain the cause of the difficulty, and then to adopt such measures as would insure its removal.

After removing the solid matter which had accumulated in the hydraulic main, which not only caused the obstructions in the first place, but likewise formed a nucleus for the deposition of fresh matter, he turned his attention to so adjust the level of the liquid in the main as to prevent a repetition of the evil. We regret that we cannot give illustrations of this arrangement by means of diagrams. The only report of the paper which we have seen is that contained in the *Journal of Gas-Lighting*, and it is exceedingly meagre in details. As we cannot do better, we must take the description as we find it:

"The present mode of adjustment is as follows, viz.: The hydraulic main is provided with a partition at one end, or at the end of each length of pipe, and the surplus fluid flowing over the top, escapes to the tar-wells. Of course the lighter fluids —such as water and oil—go first, and the heaviest of the tar settles down into the bottom of the main, to form a seal for the dip-pipes. To remedy this, he got a malleable iron length of main made, two feet in diameter, and took a semicircular pipe, with a T-branch from the underside of it, outside up as high as the fluid level; and also a semicircular pipe from the top of the main to meet this pipe from the underside. By this means, the heavy tar is to be taken away first, and the oil and water remain behind to seal the dip-pipes. After working this for a year, he took off the end of the main, and found only strong ammoniacal water, while the skin of the pipes was quite clear He can now work at any temperature without obstructions."

This may suffice to give some hints to those of our readers who may have suffered from the same cause, and who have sought in vain to prevent the formation of these obstructions. We would be glad to have the entire paper of Mr. WHIMSTER for publication, and we should think that the periodical which assumes to be the organ of the British gas-light interests, would consider the subject of such importance as to print the paper entire, and not put off its readers with a garbled extract.

A third interesting paper was read at the same meeting by Mr. PROCTOR, engineer of the Forfar Gas-Works. His subject was "Retort Settings," a subject which is now attracting particular attention in one of the largest companies in this country. The report of this paper is even more contracted than that of the others; although Mr. PROCTOR stated that by his new method of setting and heating the retorts, he could make six retorts do the work of nine, and with them turn out 23,000 instead of 16,000 cubic feet of gas per day.

If gas engineers would meet more frequently than they do, and compare notes, and express their views for their mutual advancement, we would have many improvements to report. Gas-engineering has been styled a profession so very conservative as to admit of few reforms. It is a branch of technology in which not many innovations have been recently made, but as the most devoted of its followers will admit, it will yet bear the application of new inventions, by which it is hoped that the art will be still more simplified. and the process cheapened.

PETROLEUM-GAS *vs.* COAL-GAS.

A short time ago we reprinted from our foreign exchanges a statement of Mr. GEORGE BOWER, of St. Neots, relating to some experiments he had made upon the cheapness of petroleum-gas compared with ordinary coal-gas. That gentleman has recently sent a corrected account of his essays to an English paper. The results therein enumerated do not differ materially from the statements published in this JOURNAL, and the conclusions are likewise in favor of coal, as being cheaper than petroleum as a gas-yielding substance. These experiments were made by Mr. BOWER several months ago, when crude petroleum was held at a much lower price than at present, and the reasons he gives for pronouncing in favor of coal are now much stronger than then, as the increased demand for petroleum, and the rapid advance in the rates demanded for it, have placed it almost entirely out of the category of gas-making materials. Mr. BOWER remarks that—"Coal undoubtedly makes the cheaper light by far." This conclusion must be reached by every candid experimenter, and as there is no lack of strong arguments to prove the proposition, the futile predictions of those who foretold that coal would be replaced by petroleum, must fall to the ground. Money is the touchstone by which a question of this kind is decided. Mr. BOWER declares that petroleum-gas costs about five times as much as coal-gas, but as a sort of offset to this assertion, he awards to petroleum-gas a brilliancy equal to three times that of coal-gas. To the former of these remarks we can assent; but to the latter we can only say that the coal-gas used by Mr. BOWER must have been of an unusually poor quality, and we should think far below the Parliamentary standard of London gas.

In this connection it may not be inappropriate to state that the rapid advance in the price of crude petroleum has created a demand for Albert coal, and we know of oil works that are now in full operation making kerosene oil from this material. In our last issue we remarked that this would soon be the case—not knowing that at that time large quantities of Albert coal were being shipped to Boston, and elsewhere, to be converted into illuminating oil. When petroleum reaches a certain figure, it will pay to use the coal. That figure has not only been reached, but has been passed by and left far behind; and as there is very little probability that prices will again recede, there is every reason to believe that a steady and increasing demand will be experienced for the coal which is so readily converted into oil, under the various patents which have been taken out in this country, both by native citizens and foreigners. If it has been found expedient to use coal for manufacturing oil, we think it can hardly be held that crude petroleum will ever be numbered among gas-making substances, except in rare cases, and in works of small size, such as those attached to hotels and private residences. This fact is undoubtedly a sore disappointment to the scores of patentees of petroleum-gas—many of whom have expected to realize large fortunes by their respective processes.

HILLS' GAS PURIFYING PATENT.

After the 24th of November next, the process of purifying gas by means of hydrated per-oxide of iron, which was patented in England by Mr. F. C. HILLS, will be thrown open to gas companies generally. The patent will expire on that day, and although an application was made by the patentee for its extension, the Lords of the Judicial Committee of the Privy Council decided against it. This patent has been the cause of a great deal of litigation, and so closely resembled the patents of other parties, as to cause very nice distinctions to be made in order to draw the line of demarcation between them. We have published articles on this subject, showing the near resemblance between these different patents, and explaining the legal and technical points involved, and commented at some length upon the decision of the Lord Chancellor of England, rendered not far from a year ago.

In the evidence given before the committee, it was stated that by the use of HILLS' purifying process, when the claims of the patentee do not interfere—which means, we suppose, when no royalty is charged—that not only does it cost nothing to purify the gas, but this part of the process is actually productive of gain to the company using it. This being the case, gas companies using the process will be enabled to reduce the price of gas, so that consumers will participate in the benefits of the expiration of the patent, as well as the companies themselves. This accounts for the strong popular opposition to the extension of Mr. HILLS' patent, and as he seems to have been already amply repaid for his invention—or, more properly speaking, discovery—the decision of the committee cannot but be considered equitable and just. It is said that the profits which have accrued to Mr. HILLS in the shape of royalties, &c., exceed the large sum of $500,000. If this be true, he ought surely to rest satisfied with it, and to throw open the benefits of his discovery to conumers' generally.

The value of refuse materials is very prettily illustrated by the application of the spent oxide of iron resulting from the use of this process, to the manufacture of sulphuric acid. The oxide becomes saturated with the sulphur contained as an impurity in gas, and is then valuable as a source of this important element. It is the utilization of the spent—or rather impregnated—oxide of iron which is profitable, for after the sulphur has been extracted from it, it may again be used in the purifiers, and pass several times through this routine before becoming finally unfit for the purpose.

WHAT'S IN A NAME?—The Petroleoscope is the name of a new instrument invented by Dr. L. Van Lohe, of Amsterdam, and manufactured and sold by Mr. Van Deene, maker of physical instruments in that city. Its object is to show the degree of inflammability of any description of hydrocarbon oil.

FINANCIAL.

Wednesday Evening, September 30th, 1863.

The high value set upon the shares of our city gas-light companies, was fully demonstrated by the prices brought at the sale of the stocks belonging to the estate of the late ANSON G. PHELPS, which took place on the 15th instant. At this sale the following figures were obtained:

50	Manhattan Gas Co.				262
150	do	do			261
300	do	do			260
50	Manhattan Gas-Light Co. Scrip				226
322	do	do	do		225
128	do	do	do		225¼
400	Metropolitan Gas-Light Co. Stock			$100 each	134½

The sale attracted a large number of spectators, and the bidding was quite spirited. That such high prices should be obtained at a time when so much stock changed hands, is additional evidence of the value attached to gas-light securities. The amount which *Metropolitan* shares brought, shows that this new company is already strong in the confidence of moneyed men, and seldom have new enterprises been regarded so favorably. Holders of this stock know very well that the same future is before the *Metropolitan* Gas-Light Company as was years ago before the *Manhattan*, and that the same extensions and improvements must be made in their district. The city of New York being circumscribed by water, the only room for its expansion is over the district of the *Metropolitan*, and, judging from the present activity among real estate dealers, and the large number of new houses being constructed, it is safe to predict that the territory of the latter company will be fully occupied ere many years roll round, and that the increase in the number of their consumers will be rapid.

Citizens' Gas Company shares, Brooklyn, N. Y., are still quoted at 123 to 125, with very few transactions. This stock is a favorite investment with many capitalists, who complain they cannot get all they want of it.

A parcel of *Paterson*, N. J., stock is on the market, but it is held at terms rather above the views of buyers.

Very few other gas shares are offered, and transactions are limited in extent. Gas companies generally are doing so well that their sharholders are unwilling to part with their securities.

CORRESPONDENCE.

OUR FRENCH CONTEMPORARIES.

PARIS, FRANCE, August 30, 1863.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

My health has not permitted me to see any of the European gas-works, nor did I see any of the gas-men in England, although I hope to do so on my return there.

I have had the pleasure of seeing here Mr. Emile Durand, editor of *Le Gaz*, and Mr. Blanchet, editor of *Le Journal de l'Eclairage au Gaz*, both of which journals, I am happy to say, are prospering. Mr. Durand has just published a valuable little book of 200 pages, addressed to gas companies, entitled "*Guide de l'Abonne, au Gaz d'Eclairage*," of which he has very kindly sent you a copy.

The other journal has changed hands, in part being published at the same bureau, and under the same ownership with *Le Journal des Chemins de Fer*. From the pressure of business at this bureau, it is evident that your *confrère* is reaping a reward for his labors.

Both Messrs. Durand and Blanchet were cordial in receiving one in a measure identified with American gas interests, and offered the usual courtesies.

At the latter bureau I met Mr. Kearney, manager of the Clonmel, Ireland, gas-works. He heard my name, and introduced himself a subscriber to your JOURNAL. Mr. Kearney is a young man, full of the enthusiasm of his profession, and gave me quite an interesting history of his little works, which are thriving nicely. With a population of 11,000, he issues 15,000,000 of cubic feet annually, and by economy and close management, divides eight per cent., and adds something to the plant every year. Mr. K. gave me a warm invitation to pass a day or two with him in his bachelor home at Clonmel, and see the green fields of the southern counties of the Isle. He impressed me most favorably, and I enjoyed greatly his fresh and enthusiastic expressions in reference to his profession and his country.

Should I be able to visit any of the gas-works, I will send you a brief note of them. M.

FAIR OF THE AMERICAN INSTITUTE.

The thirty-fifth annual fair of the American Institute, was recently held in the Academy of Music, in this city. When viewed in all its bearings, the exhibition cannot be called a success. There were too many essentials wanting, and too great a deficiency in the supply of articles exhibited, to render a visit to the fair anything more than passably attractive. We missed the vast array of those specimens of skill and ingenuity which greeted the eyes of the visitor to the fairs of the Institute in former years. We missed the noisy activity of the steam-engines, and machinery, which in former exhibitions were shown in busy operation; but, most of all, it was remarked that, however well adapted the Academy of Music might be for the purposes for which it was intended, it is the last place in which to hold a fair, or to set off to advantage the various articles, which, in another place, would have appeared to a much better purpose. Although a strong flooring was laid over the parquette, and seats in the first circle, yet the space of the whole first floor—even including the stage—was two narrow and contracted, and a cramped and pinched appearance was given to the perspective of the whole.

In making these strictures upon the exhibition just closed, we by no means intend to reflect upon the actions of the Board of Managers of the Institute. These gentlemen deserve great credit for what little amount of success may have attended the fair. That the building was totally unsuited to the purpose of holding such an exhibition, was certainly no fault of theirs; and that the number and variety of articles entered for competition was limited, is not to be laid at their door. Under the circumstances of the case, they performed their duties acceptably, and exhibitors are under many obligations to them for what attentions and facilities they received.

One great drawback to the success of the exhibition was, that owing to the insurance of the Academy, no steam was allowed to be made on the premises, and consequently no machinery could be shown in motion, except that propelled by hand-power. To a mechanic, or to one interested in the development of mechanical inventions, it was very aggravating to see what little machinery there was on exhibition, and what few engines were there, in a perfectly quiet and lifeless condition. For all practical purposes, the managers might as well have issued an order prohibiting the entrance of any machinery into the building. This department, which is usually one of the most interesting and instructive in exhibitions of the kind, was in this instance a lamentable failure. How different from the exhibitions of the Franklin Institute, in Philadelphia, where every article of machinery, from the most ponderous description of steam-engines, to the most delicate and cunningly contrived models, of minute size, are always shown in operation, seeming instinct with life, and giving the visitor some idea of their force and power.

In another instance was this nervous apprehension lest insurance might be vitiated, shown to the disadvantage of exhibitors. We refer to the important subject of lamps. Quite a number of kerosene oil lamps were on exhibition—some being the ordinary chimney lamps, while a larger number comprised those burning without a chimney. Of course, it was impossible for visitors to form any idea of the manner in which these lamps operated, without seeing them filled and lighted. Lamp manufacturers evidently held this opinion, for the number of the trade represented was very small. One of the best arrangements in the lamp line which we observed, was one of the no-chimney lamps; the draught required to consume the kerosene oil without smoke, being supplied by a very ingenious and effective mechanical arrangement, by the use of which a beautiful flame is obtained, and the annoying occurrences attendant upon broken chimneys, entirely avoided. This lamp is the invention of a Frenchman—M. F. B. De Keravenan—and was patented in 1860. At that time there was scarcely a single lamp in existence which could consume coal oil without a chimney. Mr. Racey's Acamine lamp made its appearance about the same time, and was the pioneer of all the no-chimney lamps. These differ from M. De Keravenan's invention, the principle of which was suggested by the editor of this JOURNAL, about the time the former gentleman was engaged in perfecting the application of the same idea, which was undoubtedly original with him, but the conception of which was coincident in the minds of both. This principle is very simple, and easily applied. It is well known, that in order to produce a clear smokeless flame with kerosene oil, an artificial draught of air must be produced by means of a chimney, or otherwise. The theory of the operation of a lamp chimney is this:—that the flame of the lamp instantly heats and rarefies the air in the chimney immediately above it, which, according to the laws of philosophy, at once rapidly ascends, as all heated air must do, thus creating a vacuum, by which a fresh supply of air is drawn in at the base of the chimney, and affording a sufficient quantity of oxygen to insure a perfect combustion of the oil. In M. De Keravenan's lamp, or the Æolian Lamp, as it is called, the necessary supply of air, instead of being drawn up from above by the action of the chimney, is forced up from below, by means of a small fan wheel, moved by machinery, the motive power of which is supplied by a spring. After lighting the lamp, a few turns of a key wind it up, when it keeps steadily running for six hours, requiring not a moment's care and attention, and affording a light much more pleasant and powerful than can be obtained from a lamp with a chimney. One great objection to the use of lamps with chimneys is, that a considerable amount of the illuminating power of the light is obstructed by the glass. In glass chimneys ordinarily used in kerosene oil lamps, this loss will amount to as much as eight to twelve per cent. This is no trifling quantity. If the chimneys are ground, as some of these are preferred, the loss of light will amount to 28 to 35 per cent. This loss is prevented by using a lamp without a chimney; that is, when the flame burns freely and steadily, as is seldom the case. In the Æolian lamp, which we have seen in operation, the flame is far more steady and regular than in any other lamp burning without a chimney. Indeed, the greater part of the latter are so uncertain in their operation, and require such close attention to prevent smoking, that the chimney lamps are preferred. It may be that M. De Keravernan's lamps yet need perfecting, and, as is generally the case with all new articles, the experience of the manufacturer in making them, will suggest improvements, both as regards simplicity and economy. As they now are made, the greatest drawback to their adoption is their high cost, which is too great to induce their general employment. The clock movement supplying the air to the flame, is the cause of the expensiveness of these lamps, and it is to be hoped that future improvements may materially reduce the price.

Among other articles connected with artificial illumination, we were much pleased with Roundey's patent cap burner. This consists of a brass tube fitting over any ordinary fishtail gas-burner, near the upper end of which is a spherical enlargement, filled with some substance designed to check the flow of gas. Above this sphere the tube terminates in a burner with two holes drilled opposite each other, as in the fishtail burner. These holes are considerably larger than the holes in the burner over which the cap is placed. Their operation is perfectly simple, and the gain in illuminating power is at once apparent. They are applied in a moment, and are made to fit any burner now in use, from the smallest up to the largest sizes. These burners, we are informed, have been adopted by the proprietors of the St. Nicholas Hotel, and have been in use in that building for several months. They are also employed in several large public buildings, where they effect an increase of from 80 to 180 per cent. This result seems almost incredible; and yet it has been proved by accurate photometrical experiments. The increase of light varies with the pressure of the gas. The exhibition of this little article attracted a great deal of attention at the Academy during the continuance of the

fair, and nearly all who examined it were convinced of its value.

We noticed a few gas regulators on exhibition, all of which have been from time to time advertised in this JOURNAL. The sale of these useful instruments increases as their power of lessening the consumption of gas under varying pressures is proved, and yet there are thousands of large consumers who have never applied them. When the amount of saving in gas bills, which they effect, is taken into consideration, their first cost is a mere trifle, and it is surprising that so many consumers will go on in their extravagant manner of burning gas, when, by the outlay of a few dollars, they might effect a saving of 20 or 30 per cent. in their gas bills. When gas bills amount to hundreds and thousands of dollars annually, this proportion is a sum of no insignificance, and to permit it to be wasted, when effectual remedies are at hand, is unbusiness like, and extravagant to a fault.

Leffingwell's regulator bore off the palm of superiority over all competitors, and was awarded the highest prize—a silver medal. This regulator possesses the advantage of containing no mercury, which is so injurious to meters, and other parts of gas apparatus. The Philadelphia Gas Company have placed it in all their buildings, and as the engineers of that company are men of high scientific attainments, this fact is a strong recommendation of the instrument.

The Sterling gas regulator, made by the Wheeler & Wilson Manufacturing Company, was likewise on exhibition, and received a second premium. This instrument has been frequently advertised and illustrated in the columns of this JOURNAL.

While on the subject of gas, we must not omit to mention the gas-heating and cooking-stoves, quite a number of which were exhibited. Fortunately, the underwriters of the academy could not taboo the use of gas; and, consequently, visitors had an opportunity of seeing these stoves in operation. Among others, we noticed the "Eagle Gas Stoves," which seem well adapted for the purposes for which they are intended. The internal arrangements of these stoves, both for cooking and heating, seem to be well constructed, so as to secure the greatest amount of heat by the expenditure of a small quantity of gas. The radiating surface of the heating stoves seems well adapted to throw out a sufficient quantity of heat to warm a moderate sized apartment at a small expense.

Fish's nursery lamp arrangement, for cooking food by means of a kerosene oil or gas flame, received the encomiums of the managers, and something more substantial also, in the shape of a silver medal.

The poverty of the exhibition in gas apparatus, was strikingly shown by the absence of so many of the articles indispensable in the manufacture and sale of gas. For instance, we did not see a gas-meter in the building, except one or two old ones attached to the regulators. Chandeliers and gas-fixtures were likewise wanting. Of retorts and castings, none were to be seen; while nearly every other article connected with the distribution of gas was neglected entirely. Why was this? A very few contributors might have filled the building with a creditable display of articles necessary to the gas engineer. A half a dozen firms in this city and Philadelphia, might have displayed those beautiful and delicate pieces of mechanism—wet and dry meters, pressure registers, chandeliers, globes, pendants, &c., which would have elicited the admiration of visitors, and added greatly to the success of the fair.

Connected with water apparatus, we were particularly pleased with Gaylord's patent hose, engine and hydrant coupling, manufactured by Messrs. Thomas A. Braisted & Brother, 212 Broadway. This invention, which was primarily intended only for the purposes indicated by its title, is susceptible of a wider application; and it is said that it forms a tight joint for gas and water pipes. We can hardly describe it without the aid of a diagram; but suffice it to say, that the application of this coupling, either to a hose, hydrant, or pipe, is instantaneous, and it makes a much tighter joint than any form of hose-coupling we have ever seen. Instead of having to clasp the hose and twist it several times around the thread of a screw, thereby wrenching and injuring the hose, all that is required is to place the end of the faucit within the socket of the coupling, and to turn a screw at the side, and the joint is made. The screw, being beveled, has a double action, securing the coupling by its perpendicular movement, and at the same time, by its beveled shape, forcing the coupling against a washer of rubber, thus making an air-tight joint, capable of withstanding a pressure of 200 pounds to the square inch. Mr. Braisted assures us that this joint will be found admirably adapted for gas and water pipes, and claims for it that pipes connected in this way can be more rapidly laid than by any known method.

This coupling has received testimonials from the Fire Department of this city, of the city of Brooklyn, and all of the Insurance Companies of New York, the Board of Marine Underwriters, and engineers generally throughout the country. It was used on the engine and hose that received the premium at the World's Fair in London.

Mr. H. Q. Hawley, of Albany, exhibited a new patent water-meter, said to combine cheapness with accuracy—two very important features. The water companies are anxiously awaiting the advent of a reliable low-priced meter, and a wide sale may be anticipated by the maker of any instrument that will stand the searching tests which the engineers of water companies will apply. There is very little doubt that when once a reliable meter—cheap and durable, and unerring in its indications—shall be introduced, water companies will not hesitate about adopting it. The propriety of assessing water charges by meters, is gaining ground, and daily finding favor among consumers as well as the companies who supply the water. We have not yet examined Mr. Hawley's meter, but have been informed that it meets the expectations of some eminent engineers, and that public trials will soon be made where its efficiency will be carefully tested.

In our visits to the fair of the Institute, we may have accidentally passed by other articles connected with our specialities without observing them. If this was the case, the fault must rest with the unsuitableness of the Academy as a building in which to hold an industrial exhibition. The disappointment we experienced was shared in by many others, who looked in vain for articles in which they were interested, but who found the display poor beyond all conjecture. We sincerely hope that in the future fairs of the Institute, a much more suitable building may be secured, and that manufacturers will contribute more liberally, and assist in getting up a display which will be creditable to themselves, to the Institute, and to the city.

ON THE MOLECULAR MOBILITY OF GASES.

BY THOMAS GRAHAM, F. R. S.

The molecular mobility of gases is here considered in reference chiefly to the passage of gases, under pressure, through a thin porous plate or septum, and to the partial separation of mixed gases, which can be effected, as will be shown, by such means. The investigation arose out of a renewed and somewhat protracted inquiry regarding the diffusion of gases (depending upon the same molecular mobility), and has afforded certain new results which may prove to be of interest in a theoretical as well as in a practical point of view.

In the diffusiometer, as first constructed, a plain cylindrical glass tube, rather less than an inch in diameter and about ten inches in length, was simply closed at one end by a porous plate of plaster of Paris, about one-third of an inch in thickness, and thus converted into a gas-receiver.* A superior material for the porous plate is now found in the artificially compressed graphite of Mr. Brockedon, of the quality used for making writing-pencils. This material is sold in London in small cubic masses about two inches square. A cube may easily be cut into slices of a millimetre or two in thickness by means of a saw of steel spring. By rubbing the surface of the slice without wetting it upon a flat sand-stone, the thickness may be further reduced to about one-half of a millimetre. A circular disk of this graphite, which is like a wafer in thickness, but possesses considerable tenacity, is attached by resinous cement to one end of the glass tube above described, so as to close it and form a diffusiometer. The tube is filled with hydrogen gas over a mercurial trough, the porosity of the graphite plate being counteracted for the time by covering it tightly with a thin sheet of gutta percha. On afterwards removing the latter, gaseous diffusion immediately takes place through the pores of the graphite. The whole hydrogen will leave the tube in forty minutes or an hour, and is replaced by a much smaller proportion of atmospheric air (about one-fourth), as is to be expected from the law of the diffusion of gases. During the process the mercury will rise in the tube, if allowed, forming a column of several inches in height—a fact which illustrates strikingly the intensity of the force with which the interpenetration of different gases is effected. The native or mineral graphite is of a lamellar structure, and appears to have little or no porosity. It cannot be substituted for the artificial graphite as a diffusion-septum. Unglazed earthenware comes next in value to graphite for this purpose.

The pores of artificial graphite appear to be really so minute that a gas *in mass* cannot penetrate the plate at all. It seems to be molecules only which can pass; and these may be supposed to pass wholly unimpeded by friction, for the smallest pores that can be imagined to exist in the graphite must be tunnels in magnitude to the ultimate atoms of a gaseous body. The sole motive agency appears to be that intestine movement of molecules which is now generally recognized as an essential property of the gaseous condition of matter.

According to the physical hypothesis now generally received,† a gas is represented as consisting of solid and perfectly elastic spherical particles or atoms, which move in all directions, and are animated with different degrees of velocity in different gases. Confined in a vessel, the moving particles are constantly impinging against its sides and occasionally against each other, and such collisions take place without any loss of motion, owing to the perfect elasticity of the particles. Now if the containing vessel be porous, like a diffusiometer, then gas is projected through the open channels, by the atomic motion described, and escapes. Simultaneously the external air or gas, whatever it may be, is carried inwards in the same manner, and takes the place of the gas which leaves the vessel. To the same atomic or molecular motion is due the elastic force, with the power to resist compression, possessed by gases. The molecular movement is accelerated by heat and retarded by cold, the tension of the gas being increased in the first instance and diminished in the second. Even when the gas is present both within and without the vessel, and is, therefore, in contact with both sides of the porous plate, the movement is sustained without abatement—molecules continuing to enter and leave in equal number, although nothing of the kind is indicated by change of volume or otherwise. If the gases in communication be different, but possess sensibly the same specific gravity and molecular velocity as nitrogen and carbonic oxide do, an interchange of molecules also takes place without any change in volume. With gases opposed of unequal density and molecular velocity, the amount of penetration ceases, of course, to be equal in both directions.

These observations are preliminary to the consideration of the passage through a graphite plate, in one direction only, of gas under pressure, or under the influence of its own elastic force. It is to be supposed that a vacuum is maintained on one side of the porous septum, and that air or some other gas, under a constant pressure, is in contact with the other side. Now a gas may pass into a vacuum in three different modes, or in two modes besides that immediately before us.

1. The gas may enter the vacuum by passing through a minute aperture in a thin plate, such as a puncture in platinum foil made by a fine steel-point. The rate of passage of different gases is then regulated by their specific gravities, according to a pneumatic law which was deduced by Professor John Robison from Torricelli's well-known theorem of the velocity of efflux of fluids. A gas rushes into a vacuum with the velocity

* "On the Law of the Diffusion of Gases," *Transactions of the Royal Society of Edinburgh*, vol. xii., p. 222; or *Philosophical Magazine*, 1834, vol. ii., pp. 175, 269, 351.

† D. Bernoulli, J. Herepath, Joule, Kronig, Clausius, Clerk, Maxwell, and Cazin. The merit of reviving this hypothesis and first applying it to the facts of gaseous diffusion, is fairly due to Mr. Herapath. See *Mathematical Physics*, in two volumes, by John Herapath, Esq. (1847.)

which a heavy body would acquire by falling from the height of an atmosphere composed of the gas in question, and supposed to be of uniform density throughout. The height of the uniform atmosphere will be inversely as the specific gravity of the gas, the atmosphere of hydrogen, for instance, sixteen times higher than that of oxygen. But as the velocity acquired by a heavy body in falling is not directly as the height, but as the square root of the height, the rate of flow of different gases into a vacuum will be inversely as the square root of their respective densities. The velocity of oxygen being 1, that of hydrogen will be 4, the square root of sixteen. This law has been experimentally verified.‡ The times of the effusion of gases, as I have spoken of it, are similar to those of the law of molecular diffusion; but it is important to observe that the phenomena of effusion and diffusion are distinct and essentially different in their nature. The effusion movement affects masses of gas, the diffusion movement affects molecules: and a gas is usually carried by the former kind of impulse with a velocity many thousand times greater than by the latter. The effusion velocity of air is the same as the velocity of sound.

2. If the aperture of efflux be in a plate of increased thickness, and so becomes a tube, the effusion-rates of gases are disturbed. The rates of flow of different gases, however, assume again a constant ratio to each other when the capillary tube is considerably elongated, when the length exceeds the diameter at least 4,000 times. These new proportions of efflux are the rates of the "Capillary Transpiration of Gases."§ The rates were found to be the same in a capillary tube composed of copper as they are in a tube of glass, and appear to be independent of the material of the capillary. A film of gas no doubt adheres to the inner surface of the tube, and the friction is really that of gas upon gas, and is consequently unaffected by the nature of tube-substance. The rates of transpiration are not governed by specific gravity, and are, indeed, singularly unlike the rates of effusion.

The transpiration velocity of oxygen being 1, that of chlorine is 1.5, that of hydrogen 2.26, of ether vapor at low temperatures the same or nearly the same number as hydrogen, of nitrogen and carbonic oxide half the velocity of hydrogen, of olefiant gas, ammonia, and cyanogen 2 (double or nearly double that of oxygen), of carbonic acid 1.376, and of the gas of marshes 1.815. In the same gas the transpirability of equal volumes increases with density, whether occasioned by cold or pressure. The transpiration ratios of gases appear to be in constant relation with no other known property of the same gases, and they form a class of phenomena remarkably isolated from all else at present known of gases.

There is one property of transpiration immediately bearing upon the penetration of the graphite plate by gases. The capillary offers to the passage of gas a resistance analagous to that of friction, proportional to the surface, and consequently increasing as the tube or tubes are multiplied in number and diminished in diameter, with the area of discharge preserved constant. The resistance to the passage of a liquid through a capillary was observed by Poiseuille to be nearly as the fourth power of the diameter of the tube. In gases the resistance also rapidly increases; but in what ratio, has not been observed. The consequence, however, is certain, that as the diameter of the capillaries may be diminished beyond any assignable limit, so the flow may be retarded indefinitely, and caused at last to become too small to be sensible. We may, therefore, have a mass of capillaries of which the passages form a large aggregate, but which are individually too small to permit a sensible flow of gas under pressure. A porous solid mass may possess the same reduced penetrability as the congeries of capillary tubes. Indeed, the state of porosity described appears to be more or less closely approached by all loosely aggregated mineral masses, such as lime, plaster, stucco, chalk, baked clay, non-crystalline earthy powders like hydrate of lime or magnesia compacted by pressure, and in the highest degree perhaps by artificial graphite.

3. A plate of artificial graphite, although it appears to be practically impenetrable to gas by either of the two modes of passage previously described, is readily penetrated by the agency of the molecular or diffusive movement of gases. This appears on comparing the time required for the passage of equal volumes of different gases under a constant pressure. Of the following three gases, oxygen, hydrogen, and carbonic acid, the time required for the passage of an equal volume of each through a capillary glass-tube, in similar circumstances as to pressure and temperature, was formerly observed to be as follows:

	Time of capillary transpiration.
Oxygen	1
Carbonic acid	0.72
Hydrogen	0.44

Through a plate of graphite, of half a millimetre in the same gases were now observed to pass, under a constant pressure of a column of mercury of 100 millimetres in height, in times which are as follows:

	Time of molecular passage.	Square root of density, (oxygen 1.)
Oxygen	1	1
Hydrogen	0.2472	0.2502
Carbonic acid	1.1886	1.1760

It appears, then, that the times of passage through the graphite plate have no relation to the capillary transpiration times of the same gases first quoted. The new times in question, however, show a close relation to the square roots of the densities of the respective gases, as is seen in the last table; and so far they agree with theoretical times of diffusion usually ascribed to the same gases.

The experiments were varied by causing the gases to pass into a Torricellian vacuum, and consequently under the full pressure of the atmosphere. The times of penetration of equal volume of gases were now—

	Times.	$\sqrt{\text{Density.}}$
Oxygen	1	1
Air	0.9501	0.9507
Carbonic acid	1.1860	1.1760
Hydrogen	0.2505	0.2502

The penetration of the graphite plate by gases appears to be entirely due to their own proper molecular motion, quite unaided by transpiration. It seems to offer the simplest possible exhibition of the molecular or diffusive movement. This pure result is to be ascribed to the wonderfully fine porosity of the graphite. The interstitial spaces or channels, appear to be sufficiently small to extinguish transpiration, or the passage of masses, entirely. The graphite becomes a molecular sieve, allowing molecules only to pass through.

With a plate of stucco, the penetration of gases under pressure is very rapid, and the volumes of air and hydrogen passing in equal times are as 1 to 2.891, which is a number for hydrogen intermediate between its transpiration-volume, 2.04, and diffusive volume, 3.8, showing that the passage through stucco is a mixed result.

With a plate of biscuit ware, 2.2 millimetres in thickness, the volume of hydrogen rose to 3.754 (air = 1), approaching closely to 3.8, the molecular ratio.

The rate of passage of a gas through graphite appeared also to be closely proportional to the pressure.

Further, hydrogen was found to penetrate through a graphite plate into a vacuum, with sensibly the same absolute velocity as it diffused into air, establishing the important fact that the impelling force is the same in both movements. The molecular mobility may, therefore, be spoken of as the diffusive movement of gases; the passage of gas through a porous plate into vacuum, as diffusion in one direction, or single diffusion; and ordinary diffusion, or the passage of two gases in opposite directions, as double, compound, or reciprocal diffusion.

Atmolysis.—A partial separation of mixed gases and vapors of unequal diffusibility can be effected by allowing the mixture to permeate through a graphite plate into a vacuum, as was to be expected from the preceding views. As this method of analysis has a practical character, and admits of wide application, it may be convenient to distinguish it by a peculiar name. The amount of the separation is in proportion to the pressure, and attains its maximum when the gases pass into a nearly perfect vacuum. A variety of experiments were made on this subject, of which perhaps the most interesting were those upon the concentration of the oxygen in atmospheric air. When a portion of air confined in a jar is allowed to penetrate into a vacuum through graphite or unglazed earthenware, the nitrogen should pass more rapidly than the oxygen in the proportion of 1.0668 to 1, and the proportion of oxygen be proportionally increased in the air left behind in the jar. The increase in the oxygen actually observed when the air in the jar was reduced from 1 volume

To 0.5	volume, was	0.48	per cent.
0.25	" "	0.98	"
0.125	" "	1.54	"
0.0625	" "	2.02	"

Or, the oxygen increased from 21 to 23.02 per cent. in the last sixteenth part of air left behind in the jar.

The most remarkable effects of separation are produced by means of the *tube atmolyser*. This is simply a narrow tube of unglazed earthenware, such as a tobacco pipe-stem two feet in length, which is placed within a shorter tube of glass, and secured in its position by corks, so as to appear like a Liebig's condenser. The glass tube is placed in communication with an air-pump, and the annular space between the two tubes is maintained as nearly vacuous as possible. Air or any other mixed gas is then allowed to flow in a stream along the clay tube, and collected as it issues. The gas so atmolysed is of course reduced in volume, much gas penetrating through the pores of the clay tube into the air-pump vacuum; and the slower the gas is collected the greater the proportional loss. In the gas collected, the denser constituent of the mixture is thus concentrated in an arithmetical ratio, while the volume of the gas is reduced in a geometrical ratio. In one experiment the proportion of oxygen in the air after traversing the atmolyser was increased to 24.5 per cent., or 16.7 upon 103 oxygen originally present in the air. With gases differing so much in density and diffusibility as oxygen and hydrogen, the separation is of course much more considerable. The explosive mixture of two volumes of hydrogen and one volume of oxygen, gave oxygen containing only 9.3 per cent of hydrogen, in which a taper burned without explosion; and with equal volumes of oxygen and hydrogen, the proportion of the latter was easily reduced from 50 to 5 per cent.

(To be concluded.)

‡ *On the Motion of Gases*, Phil. Trans. 1846, p. 573.

§ Phil. Trans. 1846, p. 591, and 1849, p. 349.

GREEK FIRE.

BY DR. RICHARDSON.

"General Gilmore on Thursday notified to General Beauregard that if he did not surrender the forts he would shell the city in twenty-four hours, at the same time requesting him to remove the women and children. No attention was paid to this notice, and on Friday night General Gilmore threw 15-inch shell into the city of Charleston, charged with Greek fire. On Saturday afternoon General Beauregard sent down a flag of truce boat, with an urgent protest denouncing Greek fire as a most villainous compound, unworthy of civilized nations; and demanding more time to remove the women and children from the city."

The above is the copy of a dispatch to the *Baltimore American*, dated August 24th, noon, 1863, off Morris Island. I have quoted it in full, not only because it relates to the subject of the present article, but because I conceive it to be the most momentous piece of intelligence that has yet reached England from America. It presages, I think, the practical and general application of a new order of warfare; of a system of destruction as effective over shot and shell as shot and shell have been effective over arrows and stones. "Greek fire" has been thrown into Charleston; the question follows: What is "Greek fire?" From the number of times I have been asked this question during the last few days, the answer to it seems to be one that would prove of great interest. I shall try and give the answer, therefore, as briefly and clearly as I can.

The term "Greek fire," as applied to the substance which the Federals are pouring into Charleston, is, strictly, a misnomer. The secret of the manufacture of the original Greek fire has been lost for nearly nine hundred and fifty years, and it is probable that it will not again be found, seeing that modern chemistry suggests agents quite as dangerous, and perhaps simpler, than the original. As a matter of historical interest we may, nevertheless, spend a moment in considering the nature and qualities of the combustible which bore the name of Greek fire. The tradition has come down to us that the substance employed was composed of sulphur, naphtha, pitch, gum, and bitumen, or, according to the recipe of the Princess Anna Comnena, of

sulphur, resin, and oil. It does not appear that the compound was enclosed in anything like a shell, and as it is as clear that it was hurled from the catapult, we must infer that it left the hand of the engineer in the solid form. In its course through the air it took fire with a great noise, and presented a large nucleus with a train; falling on combustible matter it set fire to it furiously, and some of the historians add that water did not extinguish the burning. It is said to have been used by the Turks with great effect against the French, under St. Louis, at the siege of Damietta; but that by-and-by they learned a method of extinguishing it as it fell. Marcus Graechus is the commonly-acknowledged inventor of Greek fire, but its use was revived later by an engineer of Heliopolis, of the name of Callinicus. Callinicus, acting under the command of Constantine Pogonates, used this fire in a sea-fight against the Saracens, near Cyzicus, in the Hellespont, and destroyed all the ships of his enemy.

Accepting, *cum grano salis*, a vast deal that has been written in respect to the effects of Greek fire, we are bound to admit that up to the close of the thirteenth century, a substance was known which, on being thrown into the air, would take fire spontaneously. The flame was probably caused by the friction of the projectile in its transit through the air; but the precise composition of the projectile it is impossible to define. Whether it be true that the fire was not extinguished by water, also cannot be told; on this point the ancients held peculiar, and not altogether mistaken, views; they imagined that sea-water, used in inefficient quantities, encouraged fire. At the battle off Cape Actium, the ships of Mark Antony, after having taken fire, were supposed to have been destroyed the more rapidly by reason of their crews having used salt water to put out the flames.

So much for ancient Greek fire; its modern representative, although intended for the same purposes, is different in character, more portable, more certain, more terrible. It is a fluid substance, is cheaply made, keeps for years, and is produced so quickly that the ingredients of which it is composed may be put together at the moment when the compound is required. In using the liquid it has to be enclosed in a shell which shall burst at a given point of destination and allow the fluid to be distributed.

The occurrence of flame from this liquid is not immediate, various circumstances modifying its action in regard to time. I made some experiments in the course of the present week with a little of the fluid that had been in my possession seven years, and found that with the temperature of the air at 63° Fah., and a fair wind blowing, combustion took place in four minutes and a half, the fluid being distributed on dry wood; on a moist surface of wood, however, at the same temperature and with the same wind, combustion was delayed half an hour. There are other differences, varying with the external conditions; but these are really of of no moment, because the engineer, if it were requisite, by calculating the temperature of the air, the force of the wind, and the moisture of the air, could come to a very accurate conclusion as to the period of combustion after exposure of the liquid. When combustion has taken place, or before combustion has taken place, it may be suppressed by water, and other means of extinguishing flame; but there is this peculiarity, that the fire is *suppressed* only, it is not *extinguished;* let the water evaporate, or remove the covering, and, though a month, a year, or a century, I had almost said, had elapsed, the chances are that the fire will break out again; and, paradox as it may seem, it is still true, the more effectual the suppression for the time, the greater is the danger when that suppression is removed.

The construction of modern "liquid fire" is based on simple scientific principles, and more methods than one may be discovered for producing it. I think—and I know its inventor, to whom I shall refer in a moment, thinks so too—that it might be so formed that it would actually burn under water. But, however much it might be modified in detail, the principle would be the same, and the principle is this: a rapidly oxydizable substance—which means a substance that, in combining greedily with oxygen whenever it can get it, gives rise to the evolution of heat and flame—is suspended for a time through a liquid, in which it is held innocuous, so long as the two are confined together, but from which it is separated spontaneously when both are set free in the open air.

The modern chemist who first brought liquid fire into notice was Mr. Wentworth Scott. I have been told that the method suggested by the late Lord Dundonald was of the same nature; but, for special scientific reasons, this view is not probable. Mr. Scott suggested the principle about eleven years ago, and during the Russian war he was untiring in his efforts to get it practically into use in our army and navy. There is an official board which received Mr. Scott, heard his plans, promised him means for experiment, nibbled at his idea, and then repudiated it, and did many very foolish things which it is not worth while to rake up; suffice it, that after tantalizing Mr. Scott for a long season, and after supplying him with "lots of forms," our circumlocutionists became acquainted with another gentleman, who proposed a liquid fire, but who, I believe, in the end, was gently dropped also—I mean Captain Disney.

While Mr. Scott's and Captain Disney's experiments were being canvassed, in 1855, I wrote a letter to the *Times* on the whole subject, which letter was inserted, and gave rise to much comment. I may state now what I could not state then positively, that at the time some inquiries were being made in a Continental laboratory, having in view the supplying of information on "liquid fire" to the Russian Government; and my great object in writing to the leading journal was to apprise our people that the Russians, who, under the direction of Professor Jacobi, were constructing very terrible implements of war, might, some day, and quickly, envelop the whole of the British fleet in flames. Fortunately, the peace which followed shortly afterwards put a stop to all proceedings of a warlike kind, and my warnings, as well as those of that eminent patriot, *Mr. Punch*, who came up nobly to second them, fell uselessly on the public ear. At the same time experiments with liquid fire did not cease; there was a gallant and ingenious officer named Captain Norton, who took up the inquiry and advanced it an important stage; Captain Norton invented a small shell for a rifle, which shell, filled with the liquid, would discharge its contents by merely striking a piece of stretched canvas, like the sail of a ship, and would set the whole rapidly in flames. His experiments, of which he carried out a great number at his own expense, pointed but to one conclusion, viz, that certain kinds of warfare, such as sieges, and battles in wooden ships, could be rendered impossible from the certainty of entire destruction.

At last, that which the English nation, or rather Government, refused to study as a means of warfare, has been turned to practical account in America. Liquid fire has found its way into Charleston, and the question to be asked is: Will its application stop there? It is folly to rest content with saying that the practice is barbarous; barbarity pertains to the use of bayonets and swords and grenades, and all else; the points to be recognized are the facts, that the Americans are using this liquid fire; that they will soon find means of improving their first attempts; that the successful employment of one liquid will suggest others; and that suddenly we may be roused to the unpleasant consciousness that all our great armaments, all our forces, all our ships, all our men, are at the mercy of a foe who has learned a new art in war, in which science has sapped courage, and in which brute force stands but second in the contest.

Let us have no mincing of a matter so essential to British interests as the application of liquid fire in warfare. The worst cannot be spoken too early; if shells charged with liquid fire were to be used by America in a war with England, there is not a wooden ship in the whole of our marine service, royal or mercantile, that would ever be absolutely safe after a single shell, even from a rifle, had thrown the treacherous and terrible combustible on to the sails, decks, or quarters; while there is not a town or fortress within range of American cannon that might not be destroyed by fire from a few well-directed shots. It behooves us, therefore, to be up and doing; we must learn either "to meet fire with fire," and to "threaten the threatener," or we must acquire the gentler art of effectually neutralizing an agent of destruction which we may scorn to employ, as beneath our civilization.—*London Social Science Review.*

ON THE CONSTANTS OF GAS ENGINEERING.

(*From the Sanitary Reporter.*)

(Continued from page 92.)

In our last paper a comparison was made between the original estimates for working the Great Central Gas Establishment, and the absolute expenses which were incurred by the company in 1861. We are now able to make this subject much more complete by introducing into the comparison the actual working of 1862. The following table contains, therefore, in addition to the figures published at p. 38 of the *Sanitary Reporter*, the working of 1862, as taken from a recent number of the *Journal of Gas-Lighting*.

TABLE SHOWING COMPARATIVE RECEIPT AND EXPENDITURE OF THE GREAT CENTRAL COMPANY FOR THE YEARS 1861 AND 1862.

	Receipt.	1861	1862
1	Sale of Gas	£61,883	£72,485
2	Rental of meters	"	"
3	Sale of old materials, including residual products and miscellaneous receipts	20,838	18,900
	A	£82,721	£91,385
4	Directors' allowances and payment to auditors	£1,083	£1,076
5	Salary of secretary and clerks	1,046	1,336
6	Collectors' commission and pay	611	749
7	Rent, rates, and taxes	1,246	1,249
8	Stationery, printing and general charges	1,268	1,512
9	Coals, including carriage dues, &c	30,760	32,633
10	Purifying materials	726	1,045
11	Supervision and labor	10,383	10,395
12	Ordinary repair and maintenance of premises	3,603	2,580
13	Ordinary repair and maintenance of mains, services, &c	5,150	6,054
14	Restoring and replacing meters	519	1,048
15	Law and parliamentary charges	4,570	400
	B	£60,965	£60,027
16	Balance, being profit — A — B	£21,756	£31,358

GREAT CENTRAL GAS COMPANY.

Table Showing Comparison of Working Expenses per Ton of Coal.

Correspond'g items in "Hughes's Analysis, pp. 26, 26.		Parliamentary Estimates, 1850. Croll.	Barlow.	Average of London Companies, 1861.	Actual Working of Great Central Co. 1861	1862
		s.	s.	s.	s.	s.
11.12	Labor, wear and tear of retorts, and maintenance of works	6.04	8.24	7.64	7.27	6.34
10	Purifying materials	.17	.25	.41	.38	.51
13	Wear and tear of works and mains	1.53	1.54	1.20	2.68	2.97
6	Collection and bad debts	.62	.92	.43	.32	.37
7	Rates and taxes	.62	1.95	.89	.65	.61
15	Law expenses	.15	.25	.35	2.38	.20
8	Stationery, incidentals, &c	.60	.60	.44	.66	.74
4	Diectors	1.00	1.00	.40	.56	.58
5	Salaries	1.50	1.50	.78	.54	.65
14	Wear and tear of meters	.37	1.60	.47	.27	.51
	Cost per ton, exclusive of raw material	12.60	17.85	13.01	15.71	13.43

It will be observed that the working expenses of 1862 correspond much more nearly than in 1861 with the average for all the companies, and the coincidence with Mr. Croll's original estimate is very remarkable, and highly creditable to his penetration and judgment. On the other hand, it will be seen that Mr. Barlow, who had access to all the books and other information stored up by the old London companies, produces an estimate 25 per cent. in excess of that which is found to be the result of actual experience on the largest scale.

In concluding for the present the subject of general estimates for the working of large gas establishments, we present the following as a good specimen. This estimate was made by Mr. Kirkham, Sen., for many years the able and experienced engineer of the Imperial Gas Company, which is said to owe much of its prosperity at the present day to the improvements introduced and the able developments effected during the management of Mr. Kirkham. The estimate which follows was made by him for the Marylebone Gas Consumers' Company, which was a project then and now much required for bringing in a competing company to supply gas throughout the borough of Marylebone, comprising the large and important parishes of Paddington, Marylebone, and St. Pancras.

* "London and its Gas Companies," by Samuel Hughes, F. G. S. Waterlow & Sons, 49 Parliament Street, Westminster, and 66 London Wall, E. C.

EXPENSES OF GAS-MAKING PER TON OF COALS.

	PER TON. s.
1. Labor in retort houses, at 1d. per cwt	1.75
2. Purifying, labor, and materials	.25
3. Engine-drivers, men at pumps, &c†	.083
4. Clerks, storekeepers, &c	.25
5. Drivers and labor at gas-holders, including fuel of engines	.375
6. Labor and delivery of coke	.58
7. Labor of landing and storing coal	.67
8. Wear and tear of torts and retorts	.83
9. Wear and tear of plant	.83
10. Salaries of engineers, secretary, accountants, and collectors	2.4375
11. Directors	.75
12. Bad debts at 1 per cent. on gas rental	.3
13. Rents, rates, and taxes	.75
14. Stationery and incidentals	.1875
15. Depreciation	1.916
Total cost of gas-making, exclusive of raw materials.	12.0000

This price of 12s. per ton of coal for all working expenses, exclusive of raw material, exclusive also of meters and public lighting, may be considered a very fair estimate at the present day.

ON THE RETURN REALIZED BY GAS COMPANIES FROM THE SALE OF RESIDUAL PRODUCTS.

I have hitherto said nothing on this subject, being desirous of keeping it quite distinct from the working expenses. The return for residual products forms, in fact, a deduction from the expense of raw material, and should always be considered in connection with this.

The usual calculation is, that a ton of ordinary Newcastle gas-coal will produce a chaldron of coke, of which one-third will be required for heating the retorts, and the remaining two-thirds will be available for sale.

In addition to this, the tar and ammoniacal liquor produce at the present time in London about 1s. 3d. for each ton of coal, and the sale of waste material as old iron, and other debris, produces nearly 9d. per ton of coal used.

The following estimate may be relied on as borne out by the experience of the London gas companies during the past year:

	s. d.	s. d.
1 ton of Newcastle coal		16 0
Less one chaldron of coke	10 0	
Deduct one-third used in the works	3 4	
Value of coke and breeze for sale	6 8	
Value of tar, ammoniacal liquor, and the waste products, including old materials	2 0	
	8 8	
Cost of raw material per ton of coal used		7 4

This amount of raw material will make, at the lowest estimate, 9,300 feet of 12 candle gas, of which allow one-sixth for loss by leakage, condensation, and gas used in the works, leaving 7,750 feet for sale; then, 7s. 4d. or 88 pence dividend by 7¾ = nearly 1s. per 1,000 feet of gas sold for the cost of the raw material.

Taking 12s. as the cost per ton of all other expenses, including renewal of the works, this amounts to $\frac{12}{7750}$ = 15½d. per 1,000 feet actually sold.

Taking a capital of £5 per ton of coals carbonized, every 3d. additional per 1,000 feet will pay interest at the rate of 2 per cent. Hence, collecting these items:

	PER 1,000 FEET. s. d.
Cost of raw material	1 0
Cost of working expenses	1 3½
Interest	0 6
Cost of gas	2 9½

per 1,000 feet to pay interest at 4d. per cent., while 3s. 0½d. per 1,000 feet will pay interest at 6 per cent., and 3s. 3½d. per 1,000 feet will pay interest at 8 per cent.

The following table presents at one view the returns for waste products from each of the London companies during the year 1861.

GAS COMPANIES SUPPLYING THE METROPOLIS.

Table showing the amounts received in the year 1861 from the sale of residual products, old materials, and miscellaneous receipts, compiled from the accounts made out for the Secretary of State, in compliance with the Metropolis Gas Act, 1860:

† The site of the works was near Greenford, several miles west of Paddington, and it was proposed to pump the gas into large gas-holders, where it was to be stored for consumption. Hence the heavy charge in connection with engines and pumps.

Name of Company.	Coke.	Breeze.	Tar.	Ammoniacal Liquor.	Old materials & miscellaneous receipts.	Total.
	£	£	£	£	£	£
Charter	35,924	1,595	4,849	1,478	9,354	53,200
City of London	18,941	658	2,838	860	1,011	24,308
Commercial	18,855	652	1,440	946	533	21,926
Equitable	10,470	504	2,084	582	3,431	16,971
Great Central	17,157	252	1,998	1,210	221	20,838
Imperial	69,075	1,134	6,692	2,416	9,970	89,287
Independent	12,730	290	1,402	517	109	15 048
London	28,489	1,210	4,310	935	3,305	38,269
Phœnix	28 304	456	3,625	2,171	504	35,060
Ratcliff	5,988	159	683	210	88	7,128
South Metropolitan	13,915	356	1,501	647	1,029	17.448
Surrey Consumers'	12,940	374	1,458	721	719	16.212
	272,288	7,640	32,830	12,663	30,274	355,695
Western	3,439	1,192	1,309	249	72	6,261
	275.727	8,832	34,139	12,912	30,346	361,956
Returns per ton of coal exclusive of the Western	s. 6.35	s. 0.17	s. 0.77	s. 0.30	s. 0.71	s. 8.30
The Western Company	2.67	0.93	1.02	0.19	0.06	4.87

From this table it will be seen that while the coal costs a trifle over 16s. per ton, the return for residual products realized by all the companies supplying common gas is nearly 8s. 4d. per ton, or something more than half the price of coal.

In the case of the Western Company, which makes exclusively cannel gas, the return is under 5s. per ton of coal, or only about one-fifth of the price paid for coal. The relative proportions received by the companies for coke, breeze, tar, &c., may be so readily seen in the table that it is unnecessary to recapitulate them.

The Lancashire gas companies, which also make entirely cannel gas, receive back between one-third and one-fourth the price of coal from the sale of waste products. Their coal, however, does not cost them so much per ton as it does the Western Company, so that the absolute return for products in Lancashire is not greater per ton of coal than that of the Western Gas Company in London.

The two following examples show how widely the London companies differ from each other in the comparative amounts which they receive from their products. With the view of showing this I contrast the two companies, the Commercial and the Surrey Consumers', these being the two which receive, respectively, the smallest and the greatest amount for their residual products.

RESIDUAL PRODUCTS.

	Coke.	Breeze.	Tar.	Am.	S. Pro.	Total.
Commercial Co.	£18,355	£652	£1,140	£946	£533	£21,926
Per ton	s. 5.65	s. .20	s. .44	s. .29	s. .16	s. 6.75
Surrey Consumers'	£12,940	£374	£1,458	£720	£719	£16,212
Per ton	s. 9.28	s. .26	s. 1.04	s. .51	s. .51	s. 11.60

The opinion has often been expressed by the most eminent gas-engineers, and by those who have paid most attention to the subject, that the price of coal does not and ought not to affect the price of gas in anything like the same proportion. As a general rule, when the price of coal is high the price of coke is also high, so that with a very high and a very low price of coal the cost of the absolute raw material for making gas may be the same, or nearly the same.

I do not propose, at the present time, to give any illustrations of the prices derived from residual products by provincial gas companies, but will only observe that the very valuable returns from gas companies published in a recent number of the *Sanitary Reporter* will enable any person interested to estimate with precision the cost of the raw material for making gas.

Having regard also to that return, and to the data contained in the former part of this article, he will have no difficulty in estimating the proper price to be charged for gas in any town which the return embraces, and thus to satisfy himself whether the companies charge an extravagant or a proper price.

(To be continued.)

AMERICAN CLAY RETORTS.—The high rate of exchange which has continued during the past two years, has largely increased the demand for American clay retorts.

DURATION OF THE ENGLISH COAL FIELDS.

At the opening of the meeting of the British Association for the Advancement of Science recently held at Newcastle-on-Tyne, England, the President, Sir Wm. Armstrong, delivered an able address, alluding to a large number of subjects; and among others, the probable duration of the British coal-fields—a subject of great importance to the future prosperity of Great Britain—was considered.

The following extracts from the address, as we find it reported in the columns of the London *Ironmonger*, afford themes for statisticians, and others, who have an aptitude for calculations:

DURATION OF OUR COAL-FIELDS.

"The quantity of coal yearly worked from British mines, has been almost trebled during the last twenty years, and has probably increased tenfold since the commencement of the present century; but as this increase has taken place pending the introduction of steam navigation and railway transit, and under exceptional conditions of manufacturing development, it would be too much to assume that it will continue to advance with equal rapidity. The statistics collected by Mr. Hunt, of the Mining Record Office, show that at the end of 1861, the quantity of coal raised in the United Kingdom had reach the enormous total of 86,000,000 tons, and that the average annual increase of the eight preceding years amounted to 2¾ millions of tons. Let us inquire, then, what will be the duration of our coal-fields if this more moderate rate of increase be maintained. By combining the known thickness of the various workable seams of coal, and computing the area of surface under which they lie, it is easy to arrive at an estimate of the total quantity comprised in our coal-bearing strata. Assuming 4,000 feet as the greatest depth at which it will ever be possible to carry on mining operations, and rejecting all seams of less than two feet in thickness, the entire quantity of available coal existing in these islands has been calculated to amount to about 80,000 millions of tons, which, at the present rate of consumption, would be exhausted in 930 years; but with a continued yearly increase of 2¾ millions of tons, would only last 212 years. It is clear that long before complete exhaustion takes place, England will have ceased to be a coal producing country on an extensive scale. Other nations, and especially the United States of America, which possess coal-fields 37 times more extensive than ours, will then be working more accessible beds at a smaller cost, and will be able to displace the English coal from every market. The question is, not how long our coal will endure before absolute exhaustion is effected, but how long will those particular coal-seams last which yield coal of a quality and at a price to enable this country to maintain her present supremacy in manfacturing industry. So far as this particular district is concerned, it is generaly admitted that 200 years will be sufficient to exhaust the principal seams, even at the present rate of working. If the production should continue to increase as it is now doing, the duration of those seams will not reach half that period."

WASTEFUL EXPENDITURE OF FUEL.

In connection with the foregoing, the annexed extract on the wasteful expenditure of fuel is apropos. To obtain all the benefits of fuel, and yet to consume it in an economical manner, has long been the aim of experiment:

"In an ordinary furnace employed to fuse or soften any solid substance, it is the excess of the heat of combustion over that of the body heated which alone is rendered available for the purpose intended; the rest of the heat, which in many instances constitutes by far the greater proportion of the whole, is allowed to escape uselessly into the chimney. The combustion also in common furnaces is so imperfect that clouds of powdered carbon, in the form of smoke, envelope our manufacturing towns, and gases, which ought to be completely oxygenized in the fire, pass into the air with two-thirds of their heating power undeveloped. Some remedy for this state of things we may hope is at hand in the gas regenerative furnaces recently introduced by Mr. Siemens. In these furnaces the rejected heat is arrested by a so-called 'regenerator,' as in Stirling's air-engine, and is communicated to the new fuel before it enters the furnace. The fuel, how-

ever, is not solid coal, but gas previously evolved from coal. A stream of this gas raised to a high temperature by the rejected heat of combustion is admitted into the furnace, and there meets a stream of atmospheric air, also raised to a high temperature by the same agency. In the combination which then ensues, the heat evolved by the combustion is superadded to the heat previously acquired by the gases. Thus, in addition to the advantage of economy, a greater intensity of heat is attained than by the combustion of unheated fuel. In fact, as the heat evolved in the furnace, or so much of it as is not communicated to the bodies exposed to its action, continually returns to augment the effect of the new fuel, there appears to be no limit to the temperature attainable, except the powers of resistance in the materials of which the furnace is composed. With regard to smoke, which is at once a waste and a nuisance, having myself taken part with Dr. Richardson and Mr. Longridge in a series of experiments made in this neighborhood in the years 1857–58 for the purpose of testing the practicability of preventing smoke in the combustion of bituminous coal in steam-engine boilers, I can state with perfect confidence, that, so far as the raising of steam is concerned, the production of smoke is unnecessary and inexcusable. The experiments to which I refer, proved, beyond a doubt, that by an easy method of firing, combined with a due admission of air and a proper arrangement of fire-grate, not involving any complexity, the emission of smoke might be perfectly avoided, and that the prevention of smoke increased the economic value of the fuel and the evaporative power of the boiler. As a rule, there is more smoke evolved from the fires of steam-engines than from any others, and it is in these fires that it may be most easily prevented. But in the furnaces used for most manufacturing operations, the prevention of smoke is much more difficult, and will probably not be effected until a radical change is made in the system of applying fuel for such operations. Not less wasteful and extravagant is our mode of employing coal for domestic purposes. It is computed that the consumption of coal in dwelling-houses amounts, in this country, to a ton per head per annum of the entire population: so that upwards of 29,000,000 tons are annually expended in Great Britain alone for domestic use. If any one will consider that one pound of coal applied to a well-constructed steam-engine bolier evaporates ten pounds, or one gallon of water, and if he will compare this effect with the insignificant quantity of water which can be boiled off in steam by one pound of coal consumed in an ordinary kitchen fire, he will be able to appreciate the enormous waste which takes place by the common method of burning coal for culinary purposes. The simplest arrangements to confine the heat and concentrate it upon the operation to be performed, would suffice to obviate this reprehensible waste. So also in warming houses, we consume in our open fires about five times as much coal as will produce the same heating effect when burnt in a close and properly constructed stove. Without sacrificing the luxury of a visible fire, it would be easy, by attending to the principles of radiation and convection, to render available the greater part of the heat which is now so improvidently discharged into the chimney.

These are homely considerations—too much so, perhaps, for an assembly like this; but I trust that an abuse involving a useless expenditure, exceeding in amount our income-tax, and capable of being rectified by attention to scientific principles, may not be deemed unworthy of the notice of some of those whom I have the honor of addressing."

Bursting of a Water Main in London.—A few weeks ago, a sudden bursting of a water main occurred in St. Martins-Le-Grand, London. The rupture, which took place about half-past four in the morning, tore up the pavement for a considerable space, and a column of water several feet high rushed up from beneath the ground, in a few minutes inundating the whole of the street, and flooding the basements of a number of houses in the vicinity. When the excavators of the New River Company, whose main it was, had laid bare the pipe, it appeared that the principal collar of the main, at its junction with another pipe 12 inches in diameter, had been loosened by the pressure of the water, and that, eventually, the screw bolts had given way.

PATENTS.

UNITED STATES.

39,792.—C. D. Blinn, Port Huron, Mich., for Mode of Cleaning Chimneys:

I claim a cleaner for lamp-chimneys composed of two rods, A A, connected by a fulcrum pin, a, and provided at one end with cotton or woolen twist, or other fibrous material, substantially at set forth.

39,795.—John Broughton, Chicago, Ill., for a Faucet:

I claim the arrangement of the cylindrical barrel, F, working in the interior of the shell, C, in combination with elastic washers, b c, screw cap, D, and handle, G, or ts equivalent, all constructed and operating in the manner and for the purpose substantially as herein shown and described.

39,812.—Napoleon Hayman, New York City, for a Hydrant:

I claim the slide, B, fitted within the box, A, and provided with the opening, a, and recess, b, in combination with the service or discharge-pipe, D, supply-pipe, E, and waste-pipe, F, arranged respectively in relation with the opening, a, and recess b, in the slide, B, to operate as and for the purpose herein set forth.

39,820.—Frederick Lunkenheimer, Cincinnati, Ohio, for a Gas-burner:

I claim the conical adjustable valve, g g, figure 2, in combination with the caps or hood, C, with the screw, i, the openings, F F F, the tubes, H H and G G, for the purpose of regulating the flow of the gas, substantially as set forth and described.

39,821.—George Lutz, Lancaster, Ohio, for a Water Indicator for Steam Boilers.

I claim the combination and arrangement of the pinion, ratchet, rock shaft and float, substantially as set forth, for the purpose specified.

39,831.—James Platt, Utica, N. Y., for a Water Wheel. Antedated April 2, 1863:

I claim the buckets, D D, of curved form attached to frames, I I, which are connected by joints or hinges, d d, to the plate, B, in combination with the case, E, and the curved inclined plane, K, all arranged for joint operation, as and for the purpose herein set forth.

I further claim the combination and arrangement of the buckets D D, frames, I I, plate, B, case, E, curved inclined planes, K, pressure plate, M, attached to the semi-circular plate L, and spring, N, for the purpose herein specified.

39,832.—James Platt, Utica, N. Y., for a Water Wheel. Antedated October 17, 1862:

I claim, first, The curved sliding buckets, E E, connected to shafts, D D, and arranged with springs substantially as shown, to operate as and for the purpose specified.

Second, The combination of the cam, J, and abutment, G, when used in connection with the sliding or yielding buckets, E E, arranged as shown and described.

39,833.—James Platt, Utica, N. Y., for a Water Wheel. Antedated October 25, 1862:

I claim, first, The employment or use of the drop buckets, H, attached to the shafts, G G, when used in connection with the annular water passage, d, in the case, A, provided with the abutment, B, substantially as and for the purpose specified.

Second, The manner of operating the drop buckets, H, as herein shown and described, to wit, by means of the bent arms, I, fitted on the shafts, G G, of the buckets, provided with rollers, J, at one end; and the stationary cam, J, attached to the bottom, c, of the, case, A, and the projections, K, attached to the underside of the top plate, F, of the case A.

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Report of the Proceedings of Both Houses of Parliament on the Metropolitan Gas Bill.

The Chemistry of Gas-Lighting. By Lewis Thompson, Consulting Chemist.

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ALEX. BRANDON,
JAMES MURRAY,
RICHARD O'BRIEN,
Committee of Lamps and Gas.

THE COMMITTEE ON SEWERS of the Board of Aldermen will meet EVERY WEDNESDAY, at 2 o'clock P. M., in room No. 8, City Hall. Parties interested in any matter before the Committee will have an apportunity of being heard.

GEO. A. JEREMIAH,
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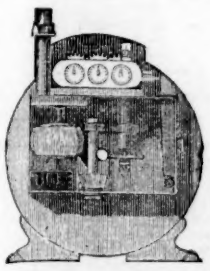

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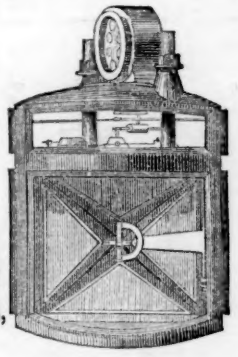

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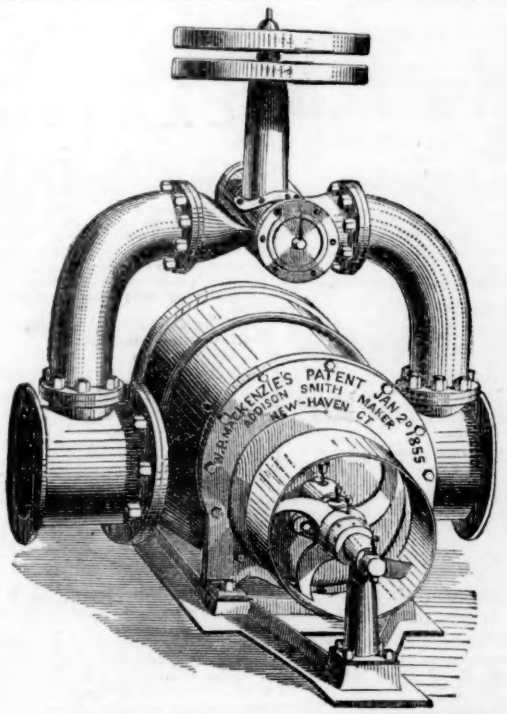

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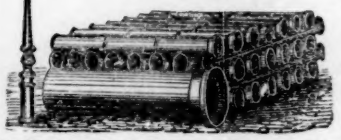

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